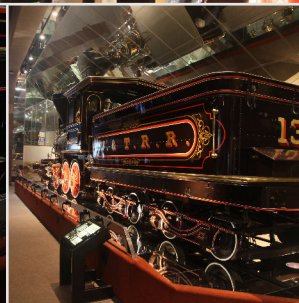
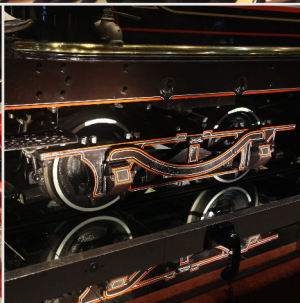
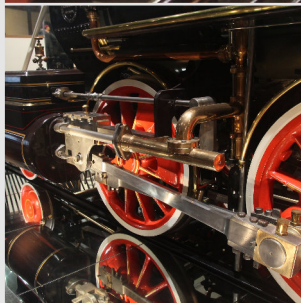
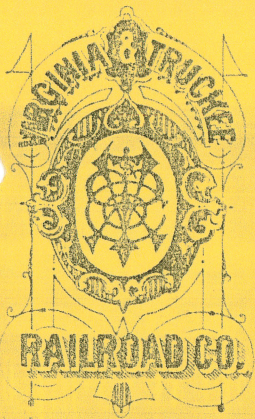


Virginia & Truckee #13

EMPIRE - STEAM LOCOMOTIVE

Feasibility Report
Restoration Options
Research and
Restoration Report





STEPHEN E. DREW

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CALIFORNIA STATE RAILROAD MUSEUM,

Old Sacramento:

EQUIPMENT RESTORATION FEASIBILITY INVESTIGATION

Compiled by

STEPHEN E. DREW

WILLIAM A. ODEN

For the

STATE OF CALIFORNIA

DEPARTMENT OF PARKS AND RECREATION

1976

VIRGINIA & TRUCKEE RAILROAD COMPANY
LOCOMOTIVE No. 13 "EMPIRE"

- 11/59
- I. Historical Perspective
 - II. Current Condition Evaluation
 - III. Restoration Recommendations

PRELIMINARY
SUBJECT TO REVISION



Oakland, California, 1976

VIRGINIA & TRUCKEE RAILROAD

LOCOMOTIVE NO. 13 "EMPIRE"

Summary

History: Virginia & Truckee Railroad Locomotive No. 13 "Empire" was built in 1873 by the Baldwin Locomotive Works of Philadelphia, Pennsylvania, for \$15,250. The locomotive was primarily used for hauling freight trains between Reno and Virginia City, for yard switching at Carson City and occasionally for mixed freight and passenger service. It was sold to the Pacific Portland Cement Company at Gerlach, Nevada, in 1924 for \$3,500 and was presented to the Railway & Locomotive Historical Society Pacific Coast Chapter in 1938. The engine was conditionally given to the State of California in 1969 and presently is stored in a former Key System Railway Inspection Barn at Oakland, California.

Condition: In 1966, No. 13 underwent a partial cosmetic renovation at the San Francisco Bethlehem Ship Yards at a cost of \$13,082; its display appearance has not substantially been altered since that time. The engine was last steamed in 1931 and it presently is inoperable due, in part, to a burned crown sheet. The locomotive has been modified and updated over the course of its career and its present mechanical appearance most closely resembles the way it looked around 1910-1912 on the Virginia & Truckee. As cosmetically restored, the "Empire" does not accurately represent its actual appearance on the Virginia & Truckee at any time but rather conveys the impression of what an old time steam locomotive might have looked like.

Restoration: General cleaning, painting and suspension system adjustment is recommended for impending public display. Further cosmetic alterations or improvements should be deferred until a well researched and completely documented full restoration can take place. An ultimate long range first priority restoration goal ought to be the careful full restoration of the engine to its magnificent original 1873-1876 as built appearance. A wealth of existing photographs and records will make possible a fully accurate restoration and a resultant superb museum show piece. The hundred year old locomotive is historically and mechanically significant and ought to be preserved.

Stephen E. Drew
William A. Oden

April 1976

CHRONOLOGY

- 1873 Built by M. Baird & Company, Baldwin Locomotive Works, Philadelphia, Pennsylvania, for \$15,250 as Virginia & Truckee Railroad Locomotive No. 13 "Empire"
- 1882 Overhauled at Carson City Shops
- 1888 Rented several months to Southern Pacific Railroad for \$10 per day
- 1889 Seldom used until 1902
- 1902 Rebuilt: American Air Brakes, Tower automatic couplers, safety appliances and sunflower stack applied
- 1910 New cab, cap stack, converted to burn fuel oil. Renumbered V. & T. Second No. 15
- 1917 Pyle National Electric generator and headlight installed
- 1918 Retired, stored Carson City Enginehouse
- 1924 Sold to Pacific Portland Cement Company, Gerlach, Nevada, for \$3500, became No. 501
- 1931 Retired, crown sheet severely burned
- 1938 Presented to Railway & Locomotive Historical Society, Inc. Pacific Coast Chapter
Stored Berkeley and Oakland, California
- 1966 Cosmetic display renovation to V. & T. No. 13 for \$13,082 at Bethlehem Ship Yard, San Francisco
- 1967 Stored former Key System Inspection Barn, Oakland, California
- 1969 Presented conditionally to State of California for static display at Old Sacramento, California

I. HISTORICAL PERSPECTIVE

1873 - 1924

Virginia & Truckee Railroad Locomotive No. 13 "Empire" was outshopped by M. Baird & Company's Baldwin Locomotive Works late in January of 1873. When Virginia & Truckee (V. & T.) General Superintendent Henry M. Yerington ordered the locomotive early in October 1872, the Nevada short line had just completed its connection with the transcontinental Central Pacific line at Reno. Suddenly, the V. & T. was taxed beyond capacity with freight and passenger traffic. Nearly all of the sidings and yards on the 52 mile line were crammed with carloads of freight destined for Nevada Comstock mining communities. Deluged with business, the newly organized V. & T. found itself without an ample number of steam locomotives and passenger carrying cars to handle the phenomenal increase in traffic. Superintendent Yerington solicited the nearby Central Pacific and Union Pacific Railroads for surplus engines and was able to rent several Central Pacific American-type locomotives on a monthly basis. This solution was only temporary, however, and Yerington reluctantly concluded that the continuing requirements of the new railroad could only be served by the acquisition of additional new motive power.

In 1872, the V. & T. owned eleven locomotives which they stabled at their Virginia City, Carson City and Steamboat engine houses. The short line's overwhelming preference for Baldwin-built locomotives was already clearly established--eight of the railroad's first eleven engines had been purchased new from the Baldwin Locomotive Works. By late in 1872, V. & T. Engine No. 12 was already on order with Baldwin and, following conversations with William Chapman Ralston and V. & T. President William Sharon, Yerington ordered two identical freight engines from Baldwin as V. & T. Locomotives Nos. 13 and 14. Following up his telegraphed instructions, he wrote the Baldwin Works on October 7, 1872, to confirm the order:

"Am just in receipt of your telegram saying 'Can furnish one (1) or two (2) locomotives January either pattern please telegraph if wanted'. I immediately answered 'Send two (2) locomotives same as Washoe much sooner than January as possible', from which you will understand we take them finished by January and as much sooner as you can get them out. Please make all possible haste for our wants are urgent. I know you will give us an A. 1. article so I say nothing on that point. Of course you will have the 'Sharon' ready at the time appointed."

With minor exceptions, the two new engines were to be built identical to the V. & T. mogul No. 10 "Washoe" which was outshopped by Baldwin early in 1872. The design of the engines was typical of 2-6-0's being widely advertised and manufactured by Baldwin during the early 1870's. The relatively small diameter of the six driving wheels made this type of locomotive particularly well suited for freight service. On the Virginia & Truckee, freight operations were especially strenuous on locomotives. Heavily laden ore cars were hauled up mining spurs to the main line where they were then carefully braked to quartz reduction mills along the Carson River. On the return trip, cordwood, board lumber, mining timbers and merchandise were hauled up the steep 2.2% grade to Virginia City.

Baldwin entered the order for the two freight engines as class 8-26 D on October 8, 1872, and promptly asked the V. & T. what they proposed to name the engines. In a letter to William Sharon on October 31, 1872, Yerington made his suggestions for naming the new locomotives:

"Baird & Company wish me to give names for the two new engines. I suggest 'Empire' and 'Esmeralda'. Mr. Mills thinks well of the names. What do you think. Please advise me."²

Ten days later, Superintendent Yerington wrote Baldwin to name the engines No. 13 "Empire" and No. 14 "Esmeralda" with the respective locomotive names to be affixed in raised, polished brass letters on the sides of the wooden cab. Empire was an appropriate namesake for the new Nevada locomotive. Empire City, located some 3 miles east of Carson City, was an important territorial town and station on the Overland Route where it encountered the Carson River. A major V. & T. station, Empire City was the location of several cord wood yards and ore reduction mills. Today only a cemetery and a few obscure foundations mark the location of this once teaming community.

Leaving Baldwin late in January 1873, the three locomotives "Genoa", "Empire" and "Esmeralda" went through Ogden on February 13th and arrived at Reno early on the morning of February 17th. After setting the engines up at the Steamboat Roundhouse, making minor adjustments and numerous trial runs, Yerington executed formal receipt of the engines from Baldwin messenger G. H. Kinzer on February 26, 1873:

"Received from Mr. G. H. Kinzer for account of Mess. M. Baird & Company Baldwin Locomotive Works, Philadelphia, three (3) locomotive engines in good order and as far as can be ascertained during a trial

of three days said engines are built, finished and completed in compliance with the contract and specifications entered into by Mess. M. Baird & Company with this Company." ³

The "Empire" was Baldwin Shop No. 3091 and had 16 x 24 inch cylinders, 48 inch diameter drivers and a total engine only weight of 70,000 lbs. At a working steam boiler pressure of 130 lbs. per square inch, the freight mogul could muster 13,792 lbs. of tractive pulling effort. The wagon top boiler held 155 two inch tubes, each 10 feet in length. The accompanying eight-wheeled tender held 2,200 gallons of water and nearly three cords of conventional 48 inch long cordwood cut in half. The locomotive cab was constructed of the best ash wood and the boiler was jacketed with the finest Russian Iron. The engine and tender were handsomely painted a maroon or dark red wine color and were thoroughly varnished. The brass dome casing, boiler jacket bands, pumps, number and letter plates, hand grab railings, running board nosing and flag fixtures were highly polished and with a wood fire in her box and a full head of steam up, the powerful locomotive was an awesome and highly respected sight in 1873! The fond memory of many a V. & T. old timer is the combination of the clear mountain air mixed with the smell of burning pitch wood and the exhaust steam of a freight locomotive like the "Empire" as it eased its final evening run toward the Gold Hill station.

Because of the V. & T.'s numerous sharp curves, the two center driver tires were "blind" or flangeless so as to freely swing in and out of gauge. The 6 inch tire facings on the remaining four flanged drivers were slightly coned and tapered 3/16 inch to allow for tolerable play in negotiating particularly sharp curves. Only the tender wheels were fitted with friction brakes while the engine was slowed and eventually stopped by reversing the cycling of steam into the cylinders.

No. 13's first trip up the mountain from Carson to Virginia City was made on Thursday afternoon, February 20, 1873. In the capable hands of conductor Chamberlain, the "Empire" left Carson at 12:10 p.m. as train No. 11-1/2 with five flat cars in tow for Comstock mining companies. The engine's first revenue freight consist was as follows:

V. & T. Flat Car No. 24, wood to Gould & Curry,
Virginia City

V. & T. Flat Car No. 27, wood to Petaluma, Gold Hill

V. & T. Flat Car No. 16, wood to Petaluma, Gold Hill

C. P. Flat Car No. 197, lumber to Crown Point, Gold Hill

C. P. Flat Car No. 2663, lumber to Crown Point, Gold Hill.

For the next 15 years, the "Empire" was used in nearly daily service hauling predominantly freight and occasionally mixed trains between Reno and Virginia City. When required, regular maintenance and repairs were performed at the V. & T.'s well-equipped Carson City Shop complex. Here the engine was overhauled in July of 1882 followed by subsequently little use thereafter owing to the falling off of V. & T. ore and freight traffic.

The "Empire" has the distinction of being among the very few Virginia & Truckee locomotives which left the V. & T. and the Reno-Sparks area while still owned by the Bonanza short line. The rare occasion was early in 1888 when the neighboring Southern Pacific Railroad found itself in the midst of a motive power shortage. For several months beginning late in January 1888, Yerington rented the thirteen to the Southern Pacific at the rate of \$10.00 per day. Returned to the Nevada road by December 1888, the engine was only rarely used by the railroad until after the turn of the century; most of its time was spent stored inside the Carson City Enginehouse. In contrast, No. 13's identical mate, the "Esmeralda", was used almost regularly in freight service until it was sold in mid May 1901 for operation at Manzanillo, Mexico.

The advent of the twentieth century brought a boom in Southern Nevada mining activity and a brief resurgence of prosperity to an ailing Nevada economy. V. & T. business increased dramatically and the railroad scurried to press every available piece of its equipment into revenue service. No. 13 was sadly in need of repairs and safety appliances before re-entering regular operation; as an unequipped locomotive, the retirement of the engine was mandated by the U.S. Interstate Commerce Commission Safety Appliance Acts of the late 1890's. In addition, the "Empire" had not seen a major overhaul in nearly 20 years. Beginning in January 1902, the engine was hauled into the Carson back shops where during the next ten months it was completely rebuilt and fitted with federally required safety devices.

Between January and October of 1902, the V. & T. expended \$4,771.50 in material and labor to completely overhaul and modernize the freight mogul. Two crossheads, piston heads, brasses, valves, cylinder head casings, a steam chest, flues, brass gauges, brake shoes and asbestos magnesia boiler lagging were all replaced. Also installed were a complete set of American engine driver and tender air brakes, a used 8 inch air pump, two No. 7 Monitor injectors, a Nathan engine lubricator, four 399 lb. flanged Midvale steel tires, Tower automatic Janney-style knuckle couplers, an acetylene headlight and a 90 lb. sunflower cone which replaced the Baldwin Yankee balloon smoke stack. A cast iron plate reading "Rebuilt Carson City 1903" was affixed as the completely reconditioned engine re-

entered regular freight service. During the next seven years, No. 13 helped handle the V. & T.'s Tonopah-related traffic and later the cattle and dairy business which was fostered by the Railway's newly laid 15 mile extension to Minden. The "Empire" became a popular wood burning switch engine in the Carson Yards and occasionally saw service as a road helper for heavy freight operations over the nearby Lakeview grade.

Once again in revenue service, further modernizing alterations were inevitable. During the year 1910, No. 13 was in and out of the Carson City Shops for various functional improvements inspired by spiraling operational costs, federal requirements and efficiency needs. As the number thirteen was generally considered to be unlucky by superstitious engine crews, the "Empire" was renumbered as V. & T. Second No. 15 effective January 31, 1910. (First No. 15 was an extremely rigid Danforth mogul which had been sold to an Oregon Railway almost 30 years earlier.) A full wood pilot replaced front foot boards on the 2-6-0 while the modified rear tender boards were retained. New 33 inch cast iron tender wheels were installed in place of original 26 inch diameter wheels and a new light weight wood cab, a larger 9-1/2 inch air pump and a cap stack were also installed. In addition, with the scarcity of local wood for fuel purposes, the engine was altered to burn the more economical fuel oil and the wood frame tender now held 852 gallons of oil in place of its earlier 3 cords of wood.

Between 1910 and 1918, the "Empire" was regularly in service as a Carson yard switcher and road helper. Its further repairs in the Carson Shops included a new fire box in October 1913 and the installation of a Pyle National boiler-mounted 32 volt DC generator and electric headlight. In a vain effort to conceal the date of construction of much of their antiquated equipment, the management of the V. & T. intentionally obscured the builder's date on several of their aging engines. During an October 4, 1917, valuation of the engine, the I.C.C. inspector was unable to determine the exact builder's date of the freight mogul and reluctantly entered "date cut off plate" on the official valuation form. While purchased new by the V. & T. for \$15,250 in 1873, No. 13's I.C.C. appraised depreciated value amounted to only \$2,391 by 1917.

In July of 1916, Second No. 15 suffered a broken driver axle and was placed out of service for the next 18 months. While eventually repaired and returned to service, the engine operated for only two additional months before it was retired and properly stored in the Carson Enginehouse. The locomotive was last steamed on May 3, 1918. While an excellent 15-20 mph road freight engine, No. 13's balance for controlled yard switching was not quite as low as on other V. & T. locomotives. In addition, V. & T. engine crews preferred the Locomotive "Tahoe" over the "Empire" on mogul assign-

ments because the rebuilt cab on No. 13 forced the engineer and fireman to sit instead of stand while doing critical switching operations. The reluctance of crews to use the locomotive coupled with the Railway's austere financial existence mandated the retirement of the "Empire" to the Carson Engine-house at the conclusion of her day's operation on May 3, 1918. The engine had seen its last active role in V. & T. train service and sat out the next six years in storage before rediscovery by a prospective purchaser.

1924 - 1966

The Pacific Portland Cement Company was incorporated in California on May 19, 1901, and by 1924 it was an energetic and profitable concern with valuable holdings in California and Nevada. One of its more modern plants was located at Gerlach, Nevada, approximately 90 miles northeast of Reno. Constructed of steel and concrete throughout, the plaster mill operated six kettles and had a 500 ton daily capacity. The property was connected with the main line of the Western Pacific Railroad at Gerlach by five miles of standard gauge rock-ballasted standard gauge railroad built and operated by the Cement Company. Altogether the firm owned seven all-time steam locomotives which it used in switching service between the plant and the Western Pacific interchange.

After negotiations stalemated on sale of the "Empire" to the Quincy Railroad Company, V. & T. Vice-President Frank E. Murphy offered to sell the engine to the Pacific Portland Cement Company for \$3,500.00 f.o.b. Reno, Nevada. The terms of the sale included a general overhaul by the V. & T. to place the engine in first class operating condition and the certification of an I.C.C. Annual Inspection Report. P.P.C.Co.'s purchase order No. 96695 covering sale of the engine was issued on December 9, 1924, and within three weeks the locomotive was retubed, painted and certified for delivery. Lettered P.P.C.Co. Consolidated No. 501, the engine left the Carson Shops on Saturday, December 27, 1924. In his consistently meticulous though abbreviated manner, V. & T. Master Mechanic Charles J. Rulison noted the transfer of the engine to its new owners:

"...left Carson 3 P.M. for Gerlach, arrived destination at 3:00 A.M. December 28th in good condition. Crew of P.P.C.Co. took engine at 7 A.M., made two trips from Gerlach to plant in forenoon. Engine worked satisfactorily and running cool."⁴

While at the plaster mill, the engine saw only limited service as a spare switching locomotive: the "Empire" was operated only six out of its first 22 months while with P.P.C.Co. With spare parts regularly ordered

from the Virginia & Truckee Shops until 1929, the engine was used only as late as 1931 when a severely burned boiler crown sheet ushered its permanent retirement.

Having already secured donation of ex-Virginia & Truckee Locomotive No. 21 for the Railway & Locomotive Historical Society's Pacific Coast Chapter, Chapter Chairman Gilbert H. Kneiss successfully obtained the ex-V. & T. "Empire" for the Chapter as the gift of the Pacific Portland Cement Company in mid 1938. During the next 28 years, the engine was variously stored by the Chapter and cooperating firms in the old Southern Pacific West Oakland Enginehouse, the Pacific Guano Company's Berkeley fertilizer yard and later by the Western Pacific at Oakland. Sitting inside stall one of the Western Pacific's West Oakland Roundhouse in 1966, the ravages of time, vandals and natural elements were overwhelmingly evident. A near derelict, basket case, the restoration of the engine seemed beyond possibility and many members and officers of the Chapter privately urged that the engine be scrapped.

1966 - 1976

"A NEW LIFE FOR 'EMPIRE': COMSTOCK IRON HORSE IS RESTORED

"The Comstock Locomotive's memory.

"Nevada's silver mine kings are almost forgotten, but the 'Empire' refuses to die.

"By all odds, the 'Empire,' born with the unlucky number 13, should have been reduced to scrap years ago.

"Such is the usual fate of a steam locomotive.

"But those who love railroading and especially the historic Virginia and Truckee R.R. thought otherwise. Because of them, the 'Empire' will never die.

"Craftsmen at Bethlehem Shipyards in San Francisco have helped the Pacific Coast Chapter of the Railway and Locomotive Historical Society restore the historic steam locomotive.

"The job was finished last month.

"Old brass fittings shine again.

"Siderods are polished.

"Delicate striping, typical of railroading a century ago, brightens the engine.

"The huge, wooden 'cowcatcher' is like new."⁵

So read an enthusiastic article in the February 5, 1967, issue of the Oakland Tribune. At a cost to the Pacific Coast Chapter of \$13,081.68, the "Empire" received a complete six month cosmetic rejuvenation which miraculously transformed the locomotive into a suitable museum display piece.

It was the effort of several Chapter members who began working at restoring the ailing wood cab and tender that convinced the Society that the engine could indeed be saved. Having already spruced up the Chapter's Denver & Rio Grande and Virginia & Truckee Combines and Northwestern Pacific Locomotive No. 112, the San Francisco Shipbuilding Division of the Bethlehem Steel Corporation agreed to undertake the facelifting transformation of the hulk to nonoperable, static display standards.

On June 20, 1966, the engine was trucked literally in pieces by B. C. Lawson Drayage from the W.P. to Bethlehem where the renewal of most of the aged wooden components began. A completely new wood cab was constructed and the entire wood tender frame was replaced. The old Russian Iron covered boiler was wired together and a new galvanized metal jacket was applied. The tender oil burning apparatus was removed and a new wood pilot was applied. A simulated balloon stack was manufactured in Los Angeles at a cost of \$798.61 by Fleming Metal Fabricators.

Many Chapter members also lent their efforts to the display restoration. Frank Saarni redid the front number plate and polished and varnished the rough casting builder's plates made by Gerald Best from the original plate owned by Roy Boswell. Ward Kimball did decorative work on the new Phillips-screwed headlight while Louis Stein and other Chapter members furnished valuable cab fittings and gauges. Utilizing Western Pacific drawings of a similar 2-6-0 and V. & T.-style paint schemes recalled by the late Fred Jukes, the cosmetic renovation of the "Empire" as an old time era locomotive was completed by November 25, 1966. An amazing reconditioning had taken place.

With Chapter Chairman Fred A. Stindt onboard, No. 13 was moved on its own wheels on March 14, 1967, at a cost to the Chapter of \$123; Western Pacific carefully handled the locomotive via the W.P. Ferry "Las Plumas" over to the former Key System Railway Oakland Inspection Barn where it presently stands. Since 1967, the "Empire" has remained in storage with

the brief exception of its public display September 12-14, 1968, along with Denver & Rio Grande Combination No. 550 and the Private Car "Gold Coast" upon the occasion of the dedication of the new Port of Oakland. Conditionally presented to the State of California effective August 10, 1969, the hundred year old cosmetically restored Virginia & Truckee "Empire" presently awaits permanent static display as part of the California State Railroad Museum at Old Sacramento.

Had it not been for the financial resources of the Pacific Coast Chapter and the interest of Bethlehem craftsmen, it is unlikely that the locomotive would be in existence today. The major transformation of the "Empire" from a deplorable condition to its present brightly colored cosmetic display appearance has undoubtedly insured its continued existence as a rare Virginia & Truckee Railroad example of an 1873 "iron horse".

NOTES

1. H. M. Yerington to M. Baird & Company, Pennsylvania, letter, October 7, 1872, Yerington Papers, The Bancroft Library, University of California, Berkeley, California.
2. H. M. Yerington to William Sharon, letter, October 31, 1872, Yerington Papers, The Bancroft Library.
3. H. M. Yerington to Baldwin Locomotive Works, receipt, February 26, 1873, Yerington Papers, The Bancroft Library.
4. Charles J. Rulison Papers, Stephen E. Drew Collection, Oakland, California.
5. Harre Demore, "A New Life for 'Empire'", Oakland Tribune, February 5, 1967.

AS-BUILT SPECIFICATIONS

Builder: M. Baird & Company
Baldwin Locomotive Works

Place: Philadelphia, Pennsylvania

Date: January 1873

Gauge: 4 feet 8-1/2 inches, 3/4 inch play

Type: 2-6-0 Mogul

Class: 8-26 D

Road: Virginia & Truckee Railroad Company

Number: 13

Name: "Empire"

Service: Freight

Fuel: Wood

Cost New: \$15,250.00

Tractive Power: 13,792 lbs.

Boiler Pressure: 130 lbs.

Weight

On Engine Truck: 9,000 lbs.

On Drivers: 61,000 lbs.

Engine Total: 70,000 lbs.

Tender Loaded: 43,000 lbs.

Total: 113,000 lbs.

Wheel Bases

Lead Truck: 6 feet 7 inches

Rigid: 9 feet 7 inches

Total: 16 feet 2 inches

Boiler

Material: Steel, chipped and caulked

Diameter: 48 inches

Type: Wagon Top, covered with felt

Dome

Casing: Brass

Beads: Iron

Jacket

Material: Russian Iron, No. 12

Bands: Brass

Safety Valves

Number: 2

Type: 1 Anderson, 1 Balance

Gauge Cocks: 4

Water Gauge: 1

Furnace

Material: Steel

Length: 65-1/2 inches

Width: 34-1/2 inches

Depth: 52-1/2 inches

Stay Bolts: 4 inches center to center

Tubes/Flues

Material: Iron, copper rings on fire box end

Number: 155

Diameter: 2 inches

Length: 10 feet

Steam Pipe: Wrought Iron, brass joints

Grates: Cast Iron, dead plate 20 inches front, 8 inches sides and back,
2 bars in each section

Ash Pan: Double Dampers

Cylinders

Number: 2

Diameter: 16 inches

Stroke: 24 inches

Steam Ports: 1-1/4 x 15 inches

Exhaust Ports: 2-1/2 x 15 inches

Valve Motion: Link

Valve Stems: Steel, right and left screw

Cylinders (continued)

Bridge Width: 1 inch

Eccentric Throw: 4-1/2 inches, "T" ends

Valve Travel: 5/8 inch

Lap

Outside: 3/4 inch

Inside: 1/32 inch

Lead: 1/16 inch

Exhaust: Double Nozzle

Oilers: In Cab

Casing: Iron

Covers: Polished Iron

Pistons

Packing: Dunbars

Guides: Steel, single bar on top

Crossheads: Cast Iron, steel pin

Rock Shafts: Wrought Iron

Drivers

Diameter: 48 inches

Center Diameter: 43-1/4 inches

Journals

Diameter: 6-1/2 inches

Length: 8 inches

Pins

Main: 4 inch diameter

Others: 2-3/4 inch diameter

Tires

Type: Steel

Size: Tapered 6 x 2-1/2 inch on flanged wheels, 6-1/2 x 2-1/2 inches on plain main

Wheel Covers: Brass Pipe

Throttle

Type: Balance Valve

Position: In Dome

Smoke Stack

Type: Yankee Balloon, netted for wood

Diameter Inside Pipe: 16 inches

Pumps

Number: 2

Type: 2-1/4 inch hollow plunger brass

Feed Cocks

Number: 2

Pipes: Iron

Check Pipes: Copper

Checks: Brass Casing

Injectors: None

Sand Box: Iron

Cab: Ash

Pilot: Iron, Round Bars

Pony Truck

Type: 2 Wheel Swing Center

Wheels

Diameter: 26 inches

Type: H. S. Taylor

Journals

Diameter: 4-1/2 inches

Length: 7-1/2 inches

Tender

Type: 8 Wheel

Square Frame: Wood

Trucks: Square Wrought Iron Frame

Wheels

Diameter: 26 inches

Type: H. S. Taylor Plate

Journals

Diameter: 3-1/2 inches

Length: 6 inches

Brakes: Double, to both trucks

Brake Beams: Iron

Safety Chains: Single

Tool Box: Rear of Tender

Tank

Height: 40 inches

Water Capacity: 2,200 gallons

Running Boards

Type: Wood

Nosing: Brass

Steam Gauge and Stand: Brass

Bell Stand: Iron, No. 1

Flag Fixtures: Brass, No. 3

Hand Rails: Brass

Oil Cups: M. Baird & Company

Number Plate: Brass

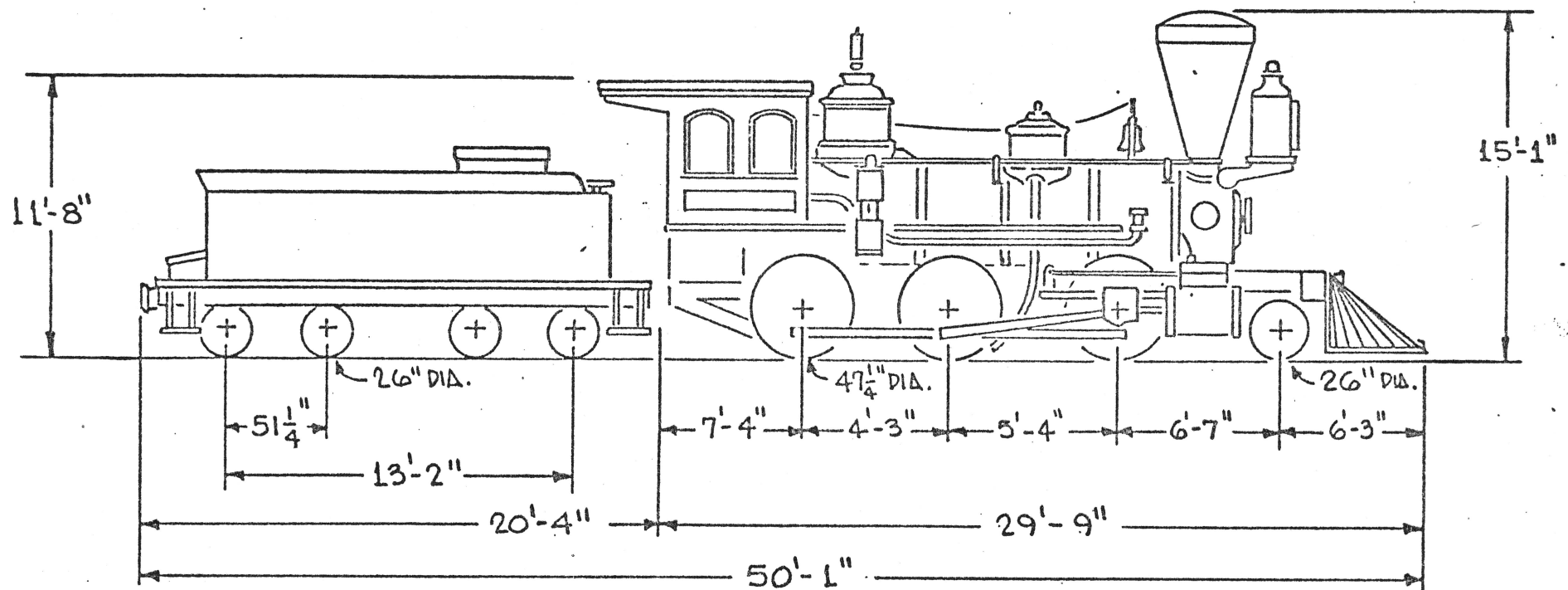
Headlight: Oil Burning

Painted Wine Color and Varnished

VIRGINIA & TRUCKEE R.R.
FREIGHT LOCOMOTIVE #13
BALDWIN ~ SERIAL # 3891

1873

CIRCA 1976



<u>WEIGHT ON DRIVERS</u>	<u>71300 LBS</u>
<u>WEIGHT ON TRUCK</u>	<u>11000 LBS</u>
<u>WEIGHT OF ENGINE</u>	<u>82300 LBS</u>
<u>WEIGHT OF ENGINE & TENDER</u>	<u>149900 LBS</u>

MAX. WIDTH OF ENGINE 9'-0"
MAX. WIDTH OF TENDER 8'-7"

WILLIAM ODEN ~ 1976

This originally V+T Eng 15
ANNUAL LOCOMOTIVE INSPECTION AND REPAIR REPORT

Dec 1924 Sold to P.P.C.C.C.

LOCOMOTIVE

Number

501

Initial, ~~V+T~~ P.P.C.C.C.

Gerlach, Nevada
VIRGINIA & TRUCKEE RAILWAY

In accordance with the act of Congress approved February 17, 1911, as amended March 4, 1915, and the rules and instructions issued in pursuance thereof and approved by the Interstate Commerce Commission, all parts of locomotive No. *501*, including the boiler and its appurtenances, were inspected on *Dec 26* 1924, at Carson City, Nevada and all defects disclosed by said inspection have been repaired, except as noted on the back of this report.

- B-1. Date of previous hydrostatic test. *Feb 23* 1918
 B-2. Date of previous removals of caps from flexible stay bolts, *none* 19
 B-3. Date of previous removal of flues. *Oct 21* 1913
 M-4. Date of previous removal of all lagging. *Oct 21* 1913
 B-5. Hydrostatic test, pressure of *165* pounds was applied.
 B-6. Were caps removed from all flexible staybolts? *none*
 B-7. Were all flues removed? *yes* Number *154*
 B-8. Condition of interior of barrel. *good*
 M-9. Was all lagging removed? *no*
 B-10. Condition of exterior of barrel. *not exam*
 B-11. Was boiler entered and inspected? *yes*

I certify that the above report is correct.

- M-22. Were steam gauges tested and left in good condition? *yes*
 M-23. Safety valves set to pop at *130* pounds *132* pounds
none pounds.
 M-24. Were both injectors tested and left in good condition? *yes*
 M-25. Were steam leaks repaired? *yes*
 B-26. Hydrostatic test of *150* pounds applied to main reservoirs.

I certify that the above report is correct.

State of Nevada }
 County of Ormsby } ss.

Subscribed and sworn to before me this _____ day of _____
 inspectors of the VIRGINIA & TRUCKEE RAILWAY.

The above work has been performed and the report is approved.

- B-12. Was boiler washed? Water glass cocks and gauge cocks cleaned? *yes yes*
 B-13. Condition of crown stays and staybolts. *good good*
 B-14. Condition of sling stays and crown bars. *good good*
 B-15. Condition of firebox sheets and flues. *good good*
 B-16. Condition of arch tubes. *none* Water-bar tubes. *none*
 B-17. Condition of throat braces. *good*
 B-18. Condition of back head braces. *good*
 B-19. Condition of front flue sheet braces. *good*
 B-20. Were fusible plugs removed and cleaned? *none*
 B-21. Were steam leaks repaired? *yes*

F. Mallinson Inspector.

- M-27. Condition of brake and signal equipment. *good none*
 M-28. Were drawbar and drawbar pins removed and inspected? *yes*
 M-29. Condition of draft gear and draw gear. *good good*
 M-30. Condition of driving gear. *good*
 M-31. Condition of running gear. *good*
 M-32. Condition of tender. *good*

E. C. Petersen Inspector.

_____, 19_____, by _____
O. R. Rulison Notary Public
 Officer in Charge

PACIFIC PORTLAND CEMENT COMPANY, CONSOLIDATED
 SAN FRANCISCO, CALIFORNIA
 PACIFIC BUILDING 96695



Reg. U. S. Pat. Office



ORDER N° 96695

This order number is to appear on all Packages, Invoices and Bills of Lading.

San Francisco, California, December 9, 1924

Virginia & Truckee Railway,
 Carson City,
 Nevada.

Please ship the following goods by freight

To PACIFIC PORTLAND CEMENT COMPANY, CONSOLIDATED
 Gerlach, Nevada.

Mail { Bill of Lading to Pacific Bldg., San Francisco.
 { Invoice in TRIPLICATE to Pacific Bldg., San Francisco.

1 - 40 Ton Baldwin Mogul Type Oil Burning Locomotive,
 Cylinders 16" x 24", Driving wheels 50" diameter,
 as inspected by our Mr. Roe on December 6, 1924.

All parts that have been removed from this loco-
 motive are to be replaced, and same is to be de-
 livered to us complete and in first class working
 order.

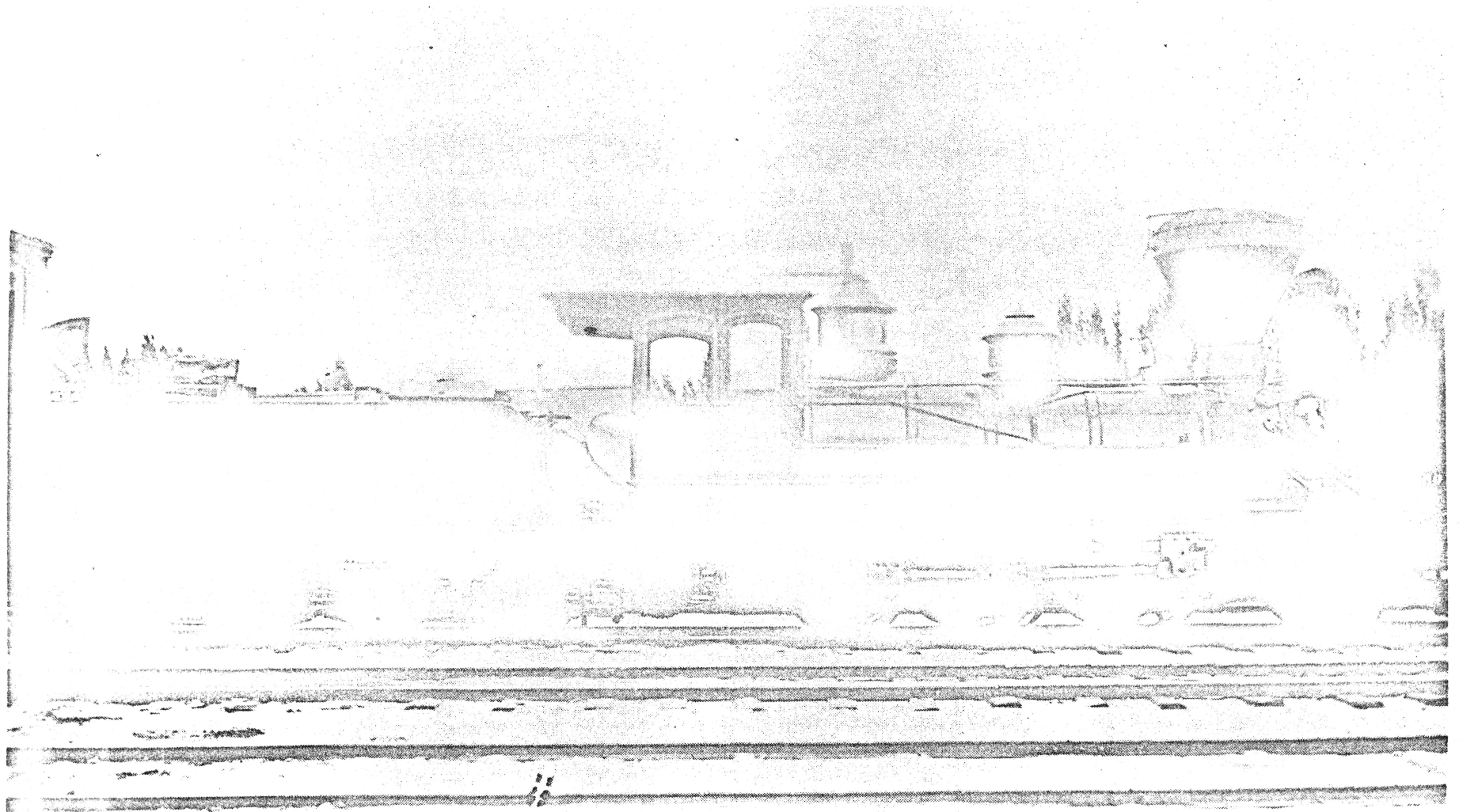
This conditioning to include an Annual Interstate
 Inspection Report.

Price - \$3500.00 f.o.b. Reno, as per your Mr.
 F. E. Murphy's letter of December 2, 1924.

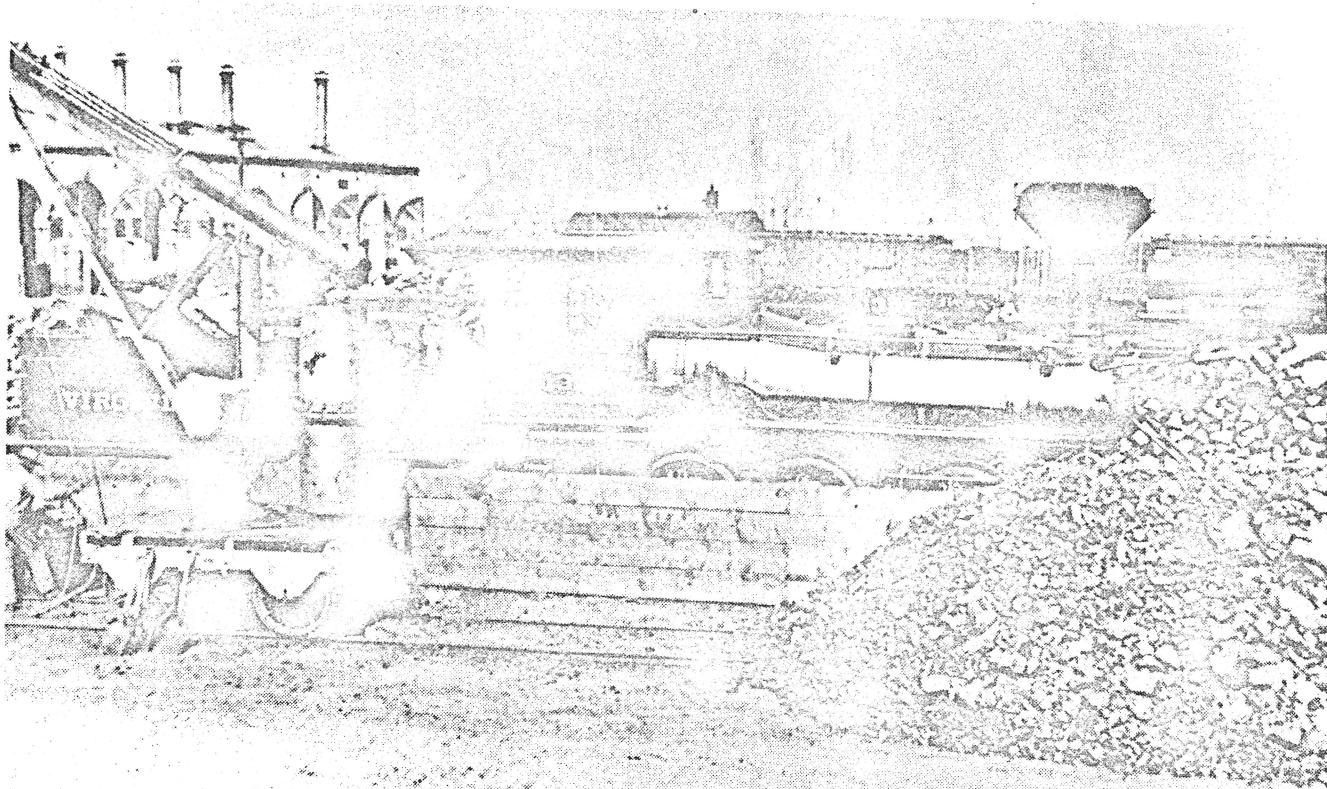
PACIFIC PORTLAND CEMENT COMPANY, CONSOLIDATED

F. E. Murphy
 Purchasing Agent

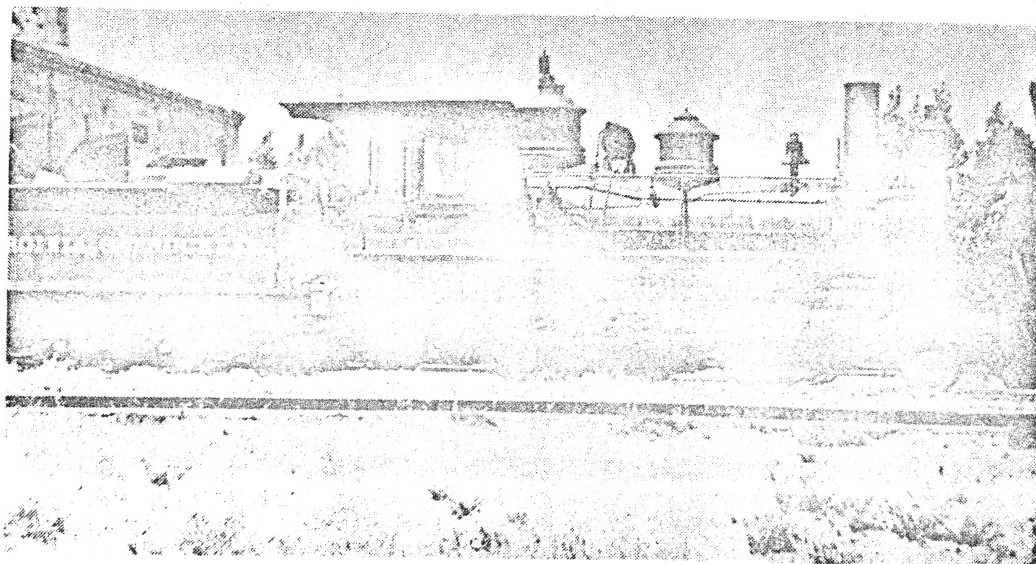
WE DO NOT ALLOW CHARGES FOR CASE AND CARTAGE



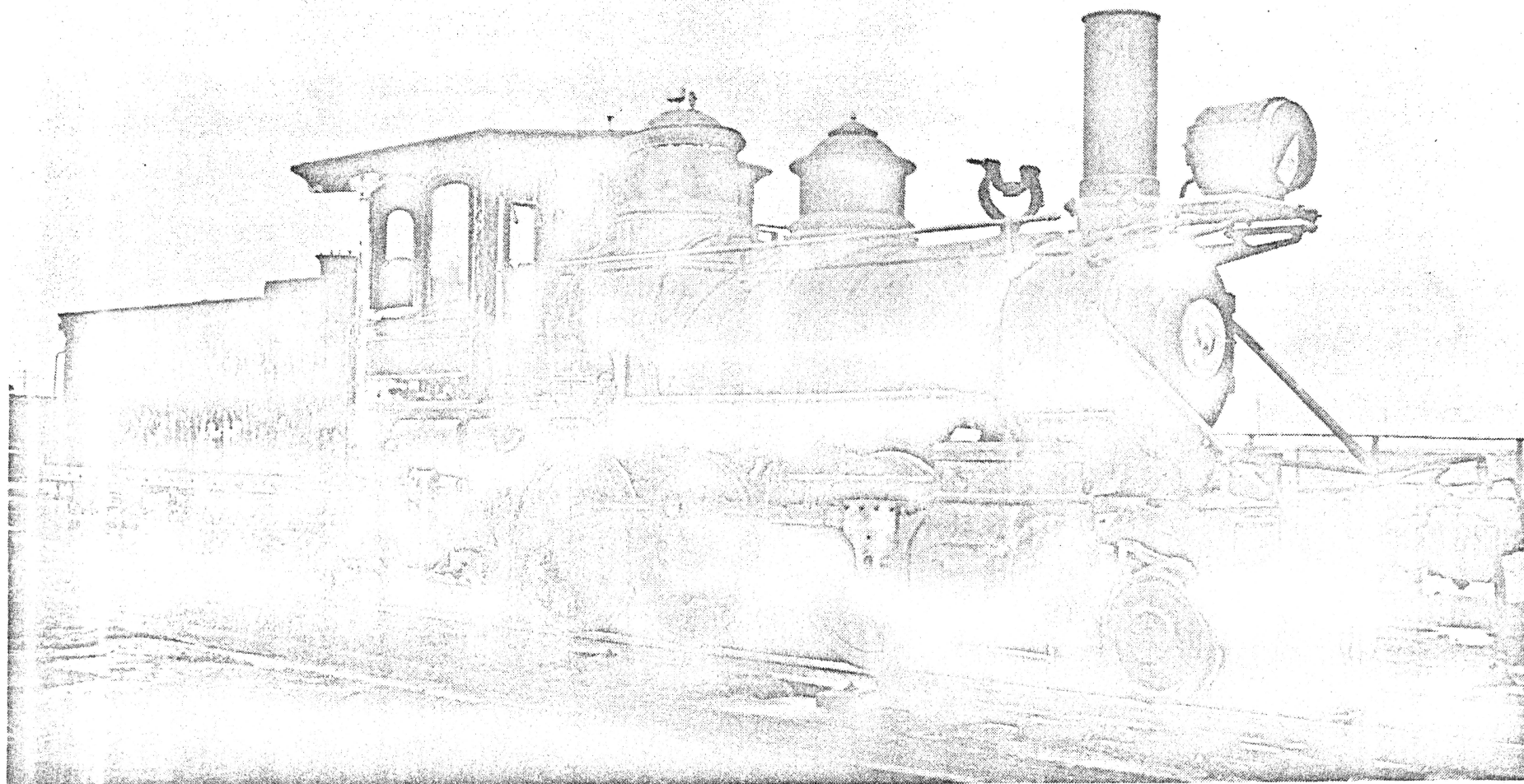
Virginia & Truckee 1873 Baldwin 2-6-0, Carson City, Nevada, 1901



Wood Loading Track, Carson City, Nevada, 1908
(Stanley G. Palmer Photo)



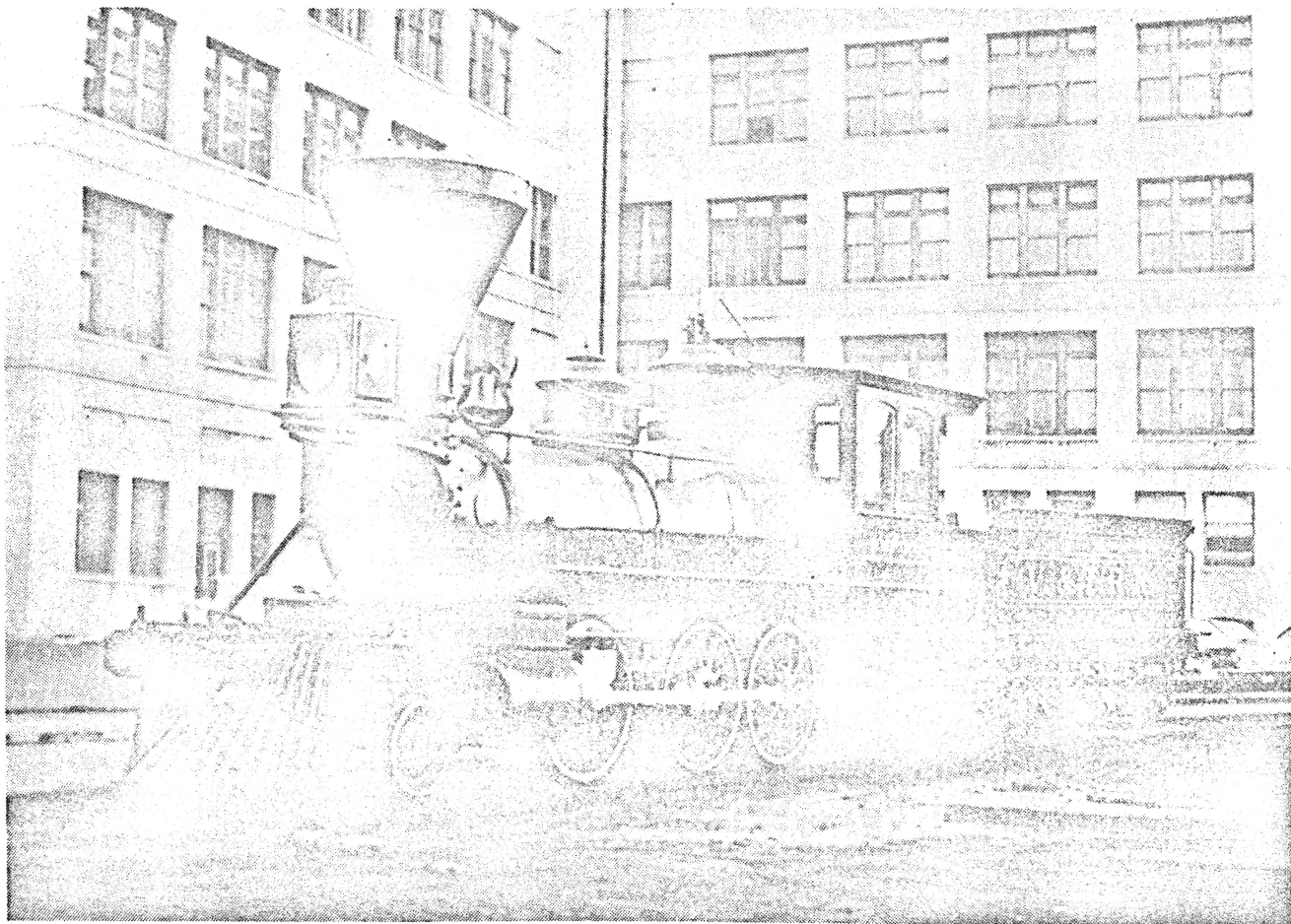
Enginehouse, Carson City, Nevada, 1924



Western Pacific Yards, Oakland, California, October 1949
(Harold K. Vollrath Collection)



Bethlehem Ship Yard, San Francisco, California, July 1966
(Bethlehem Steel Photo, Fred A. Stindt Collection)



Bethlehem Ship Yard, San Francisco, California, February 1967



Smokebox Front Number Plate

II. CURRENT CONDITION EVALUATION

Virginia & Truckee Locomotive No. 13 "Empire" is presently located on Track "C" directly east of V. & T. Combination Car No. 16 in the southwest corner of a former Key System Railway Inspection Barn at Oakland, California. The building is situated near the Bay Bridge Toll Plaza in West Oakland where it is owned by the State of California and maintained by the California Department of Transportation. While not entirely watertight, the building is kept secure and locked behind a surrounding barb wired fence. The building's only present vulnerability is its thousands of small pane glass windows which have been the target of limited vandalism and unauthorized entry in the past. While electrical power is already in the building, it is recommended that any needed restoration work be performed at Sacramento near the Old Sacramento museum site in view of the present availability of far superior shop facilities there.

Since mid March 1967, V. & T. No. 13 has rested on its own wheels on rails in static storage inside the Key Building. It was moved out only briefly in mid September 1968 for public display at the new Port of Oakland. The locomotive is generally secure and only occasionally is subjected to minimal water damage from the leaky building roof. Any potential damage to the "Empire" will likely occur as the result of vandals or heat from prolonged direct sun light occasioned by the simulated glass greenhouse nature of the building. The engine is owned by the State of California, having been conditionally presented to the State by the Railway & Locomotive Historical Society Pacific Coast Chapter, effective August 10, 1969.

The locomotive is primarily of iron, steel and wood construction and it is structurally sound for the most part. The engine was improperly handled when it was picked up and set down again by crane in June 1966 at the commencement of cosmetic restoration. When reset on the rails, the locomotive's suspension systems were not properly aligned, fitted and adjusted. This has resulted in a list or lopsided effect and the engine visibly leans towards the right or engineer's side. Left uncorrected, this misalignment will likely result in broken components.

With the exception of normal paint discoloration, dirt and wear, the locomotive's condition has not altered since completion of its six month cosmetic restoration by Bethlehem Ship Yards late in 1966. The costly renovation converted the V. & T. engine from a derelict hulk to a display museum piece. The renovation was directed toward cosmetically improving the static, nonoperable visual public display potential of the locomotive as a circa 1870's old time steam locomotive. While cosmetically sprucing up the display appearance of the V. & T. engine, however, the completed locomotive as it now stands does not accurately represent:

- a. its actual appearance at any time on the Virginia & Truckee,
- b. steam engine engineering practices, or
- c. the state of the art of Baldwin Locomotive Works construction in 1873.

In general, it represents someone's idea of what an "old engine" might look like.

While not unique, the existence of an 1873 Baldwin-built mogul 2-6-0 is certainly rare and worthy of museum display by contemporary standards. The "Empire" was donated for preservation to the Railway & Locomotive Historical Society Pacific Coast Chapter in mid 1938 through the late Gilbert H. Kneiss by the Pacific Portland Cement Company. For nearly 40 years, the Chapter has been the caretaker for the engine while constantly seeking a suitable museum site in which to display their distinguished railroad equipment collection. In view of No. 13's deteriorated condition in 1965 and pressure to dispose of the aging relic, it is unlikely that the locomotive would be in existence today had it not been for the \$13,082 cosmetic renovation which the Chapter contracted for through Bethlehem Steel in 1966. On August 10, 1969, the locomotive was included in over a dozen historic pieces conditionally presented by the Chapter to the State of California for inclusion in the California State Railroad Museum at Old Sacramento.

Minor cosmetic deviations aside, the locomotive's current appearance most closely approximates its circa 1910-1912 physical appearance on the Virginia & Truckee. This is due to the V. & T.'s modernization efforts on the engine through 1912 and the replacement and/or addition of safety appliances, automatic couplers, oil burning apparatus, injectors, driver and tender air brakes, air sanders, tapped stay bolts, a modified wood cab and pilot, and piecemeal part replacements. The engine's only major modifications in appearance since 1912 are the 1870's era cosmetic alterations made in 1966. A listing of the work performed 1966-1967 by the San Francisco Bethlehem Ship Yard is included in this report.

Immediately following is a listing of major components and a preliminary evaluation in relation to their appropriateness on the hundred year old locomotive. With the exception of inside boiler attention, deteriorated parts were replaced in 1966 so that most remaining engine components, unless otherwise noted, are in "good" to "very good" condition. Parts replaced or receiving cosmetic attention during the 1966 renovation are in the range of "good" to "excellent" condition for immediate display purposes whether accurate, appropriate or not. The evaluation is based on detailed physical inspection with the assumption of future permanent static display; the anticipated operation of the locomotive would very substantially alter the condition evaluation.

Unless otherwise noted, all modifications or alterations are presumed to have been performed by the Virginia & Truckee at their Carson City, Nevada, Shops between 1873 and 1924, inclusive.

COMPONENT ANALYSIS

Boiler: Original 1873 Baldwin Locomotive Works wagon top type boiler; last reflued December 1924 by V&T at Carson City Shops.

Jacket: Galvanized thin gauge sheet metal applied 1966 for cosmetic renovation by Bethlehem Ship Yard; false jacket covering was applied directly over existing magnesia lagging and badly rusted Russian Iron jacket. Old boiler jacket was painted with rust preventative 1966 and wired in place. Present cosmetic jacket is visibly screwed instead of riveted as was 1873 Baldwin practice. Present sheet metal jacket is profusely patched and painted; original Russian Iron had natural color and was only clear coated.

Jacket bands: 3 out of 4 are 1966 flat strip brass replacements, inaccurate for securing boiler jacket. Appropriate bands are rolled or beaded on both edges to further seal jacket joints.

Steam dome: 1, Iron with brass casing. Whistle is 1966 brass replacement, generally appropriate style. Pressure relief valves are post 1912 required additions; original safety pop was spring regulated from cab.

Generator: 32 volt DC Pyle National electric generator boiler-mounted by V&T 1917 and intact through 1937; generator missing, boiler mount, engine and tender electrical lines removed 1966.

Sand dome: 1, Iron, decoratively lettered No. 13. Sanders are 1910 modified air operated; original sanders functioned by gravity.

Bell: Iron stand and yoke; original bell stolen 1947-1949. Present bell supplied 1966 from Nevada Central narrow gauge Locomotive No. 6 and installed by Bethlehem with bell cord and handle. Bell is slightly undersize to original type furnished by Baldwin.

Smoke stack: Simulated balloon style stack manufactured 1966 by Fleming Metal Fabricators, Los Angeles; installed 1966 by Bethlehem. Light weight reproduction does not represent actual stack found on engine at any time. Original Yankee full balloon stack had full cinder collar and base clean out plug; a sunflower cone stack was applied in 1902 and a straight stack with cap was installed in 1910.

Headlight: Box oil burning headlight reproduction made 1966 by Ward Kimball and Gerald Best; excellent workmanship. Unfortunately it is too small; original V&T headlights were much larger dimension. Suggest removal of modern Phillips head screws from base for replacement with appropriate round head screws. Two headlight brackets apparently are original. Brass flag fixtures removed 1902 by V&T. Original headlight was oil burning, replaced 1902 by acetylene and 1917 by 19 inch diameter electric; remnants of headlight electrical lines removed 1966 and scrapped.

Boiler (Continued)

Hand rails: 2, Brass.

Running boards: 2, Wood, renewed 1966 with old brass nosing partially pounded out and reinstalled.

Builder's plates: 2, Brass; excellent reproductions rough casted 1966 by Gerald Best from original plate owned by Roy Boswell. Plates polished, painted and varnished by Frank Saarni; mounted on boiler smoke box.

Number plate: 1, Original plate with No. 13 recast, rivet applied, polished, painted and varnished by Frank Saarni.

Boiler stay bolts have been drilled or tapped to fulfill ca. 1920's safety requirements.

Pilot boiler braces: 2, Iron, original.

Flag/lamp brass fixtures are early castings installed after 1923.

Fire Box: No major fire box work evident. Interior sheet acid lamination evident and thinly burned crown sheet. Back plugs have been removed and boiler is not sweating. Fire box and tubes have not been cleaned; although engine is not to operate, it should be properly cleaned and stored to prevent further deterioration from acid caused by moisture in ashes.

Running Gear

Pony truck: 2, 26 inch diameter Griffin Tacoma replacement wheels.

Cylinder covers and casing: Iron, minor surface dents; covers originally polished iron.

Steam chest covers and casing: Iron, originally had tallow cups for lubrication on steam chests instead of present modern oilers.

Valves: Stephenson type.

Drivers: 6, Cast iron. Worn steel tires, 4 flanged, 2 blind or unflanged; last tire set applied was 3-1/2 inches thick instead of previous 2-1/2 inch thickness. Tires originally tapered or coned 3/16 inch.

Suspension system: Engine was improperly crane lifted and unloaded 1966 without properly aligning, fitting and adjustment of the suspension systems. An unseated spring was wired onto the frame, the eccentric straps were removed from the engine and are stored on top of the tender and the boiler was wood shimmed in place. The improper 1966 setting up gives the engine a decidedly lopsided or listing appearance towards the engineer's side of the locomotive. Left uncorrected, broken components will likely result.

Pilot apron: Intact. Early location of portable locked wooden tool box. Two turnings intact, connecting hand rail missing.

Running Gear (Continued)

Pilot beam: Wood, replaced 1966; 2 corner poling pocket castings intact.

Pilot: Wood, built 1966 by Bethlehem; far too lightweight construction for railroad operation. This style was never applied to this locomotive. Original pilot was iron rod type with unrecessed push iron bar and rooster. Original pilot replaced at early date by V&T with wood foot boards for yard switching use; later converted to full wooden staved pilot by ca. 1912.

Pilot coupler pocket: V&T Ry marked ca. 1910 iron casting, excellent.

Cab: Wood, made and installed 1966 by Bethlehem Ship Yard; duplicate of highly modified 1910 V&T cab with major exception of profuse inappropriate plywood construction. Not original style: 1873 Baldwin cab had shorter windows and oval panel on cab sides with engine name in raised brass letters. Baldwin style was to double roof. Present maroon cab has "Empire" painted in rectangular side name panels.

Windows: 10, Glasses intact, 1966 replacements throughout. Curved window arches are only cosmetic exterior simulated; windows inside as rebuilt 1966 have square corners. Not original type construction.

Hand rails: 2, 1910-12 safety design, iron; originals were brass and considerably smaller.

Floor boards: Wood, renewed 1966.

Seats: 2, Wood with cushion, renewed 1966. On V&T, fireman's seat housed 50 ft. of 2 inch cotton hose.

Lubricator: 5-spot lubricator apparently from a Shay type locomotive, applied 1966. V&T addition was a 3-spot hydrostatic lubricator. Originally had only tallow cups for lubrication on steam chests.

Oil burning equipment: 90% of 1910 oil apparatus intact; authentic pre-1910 restoration requires removal of all fuel oil appliances, addition of engine ash pan and reconversion of fire box door to early side swing type.

Steam gauge: Apparently ex-ship type applied 1966.

Backhead fittings and plumbing: Approximately 20% incomplete and fully 40% inappropriate; profuse use of non-railroad ship-style fittings. Standardization of levers and valve handles required; 1966 applied plastic hoses ought to be replaced with more appropriate material. Nearly all handles are replacements too light for 1873 Baldwin construction.

Boiler badge plate: Ca. 1910-12 V&T addition, denotes water test 163 lbs. and working pressure 130 lbs.

Tender

Underframe: Completely rebuilt frame and deck 1966 by Bethlehem.

Oil tank: Upper tank removed 1966 and scrapped, replaced with inappropriate plywood covering. Some 1910-applied oil burning apparatus still on tender.

Water tank: Scaling on inside walls; loose scaling removed 1966.

Tank spout lid is oversize replacement; not V&T type.

Tool box: Light weight wood construction box build 1966 on rear tender deck; fair to poor quality facsimile. By 1901, dual tool boxes were also installed on both front corners of tender tank; visible attachment holes in patched tender railing denote exact locations.

Footboard: "L" brackets, wood planks and hand railing removed ca. 1964 during partial tender renovation at Western Pacific Roundhouse by Chapter members.

Safety chains: Intact.

Rear headlight: Added ca. 1912 by V&T; headlight missing, bracket intact.

Flag mounts: 2, V&T additions on rear of tender railing.

Rear tender hooks: 3 Intact, intended to carry heavy gauge hooked towing wire.

Foot plates: 3 Ornate castings intact, 4 required; 1 on engineer's side is contemporary replacement.

Hand rails: 4, Iron rod ca. 1910-12 safety additions located at 4 corners of tender tank; originals were brass and considerably smaller.

Trucks: 2, Four wheel wood frame, suspect V&T modified replacements. Wheels are 33 inch cast iron; originals were 26 inch diameter.

Sides lettered oversized "V. & T. R. R." and decoratively numbered "13" on rear.

Air Brake Equipment: American Brake Company, St. Louis, No. 28873 engine and tender system supplied 1902 by V&T and modified 1910. Cap nut is missing from atop 1910 air pump: an upper portion pump governor was installed 1966 to fill the hole; a common pipe plug would have been more appropriate. Pump, cylinders, driver brakes, reservoir, gauge and lines generally intact; remove for authentic pre-1902 restoration. Originally built only with tender manually operated double iron brake beams.

Draft Gear: Tower automatic Janney-style knuckle couplers applied 1902 by V&T to fulfill Safety Appliance Act requirements; uncoupling levers intact. Originally furnished by Baldwin for link and pin coupling.

Itemized list of repair performed June 1966-March 1967 by Bethlehem Steel Corporation, Shipbuilding Division, San Francisco, California, on Virginia & Truckee Railroad Locomotive No. 13 "Empire":

Furnished necessary labor and material to perform the following repairs to one (1) Locomotive - ex-Virginia & Truckee No. 13 and one (1) Tender:

Repairs to Tender:

Removed old oil fuel tank and all connections with same-scrapped.

Removed all old electrical connections and scrapped.

Removed tender tank, cleaned and scaled bottom of tank and painted before reinstalling same. Removed all loose scale from inside of tank.

Removed all rotten timber from decking and frame of tender bed and renewed as original. Renewed hardwood bolster supporting coupler on rear of tender and hardwood bolster supporting connecting link between tender and locomotive. All new lumber had coat of wood preservative applied during and after installation.

Cleaned running gear of tender completely ready for paint.

Painted entire tender as directed by owners' representative.

Repairs to Locomotive:

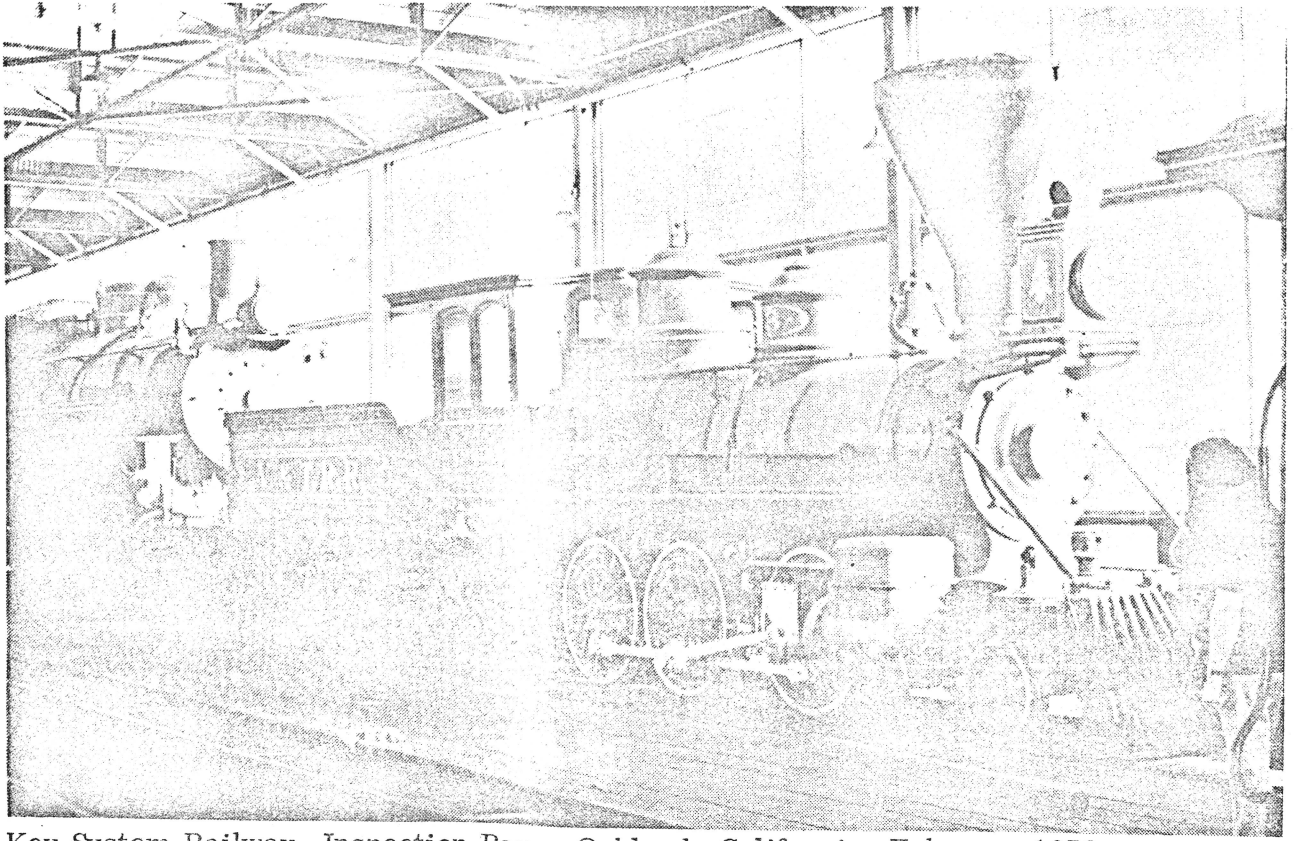
Rebuilt wooden engine cab and installed same. Renewed cab floor boards, seats, etc. as necessary to repair as original. Removed excess materials on boiler as directed. Painted existing boiler lagging with a rust preventative. Wired existing sheet metal lagging in place, then recovered entire boiler with new galvanized thin gauge metal lagging as directed.

Installed new owner furnished smoke stack, head light and miscellaneous other fittings as directed.

Made and installed one (1) new wooden pilot for locomotive. Installed front coupler.

Cleaned entire locomotive as directed and prepared for paint. Painted entire locomotive as directed.

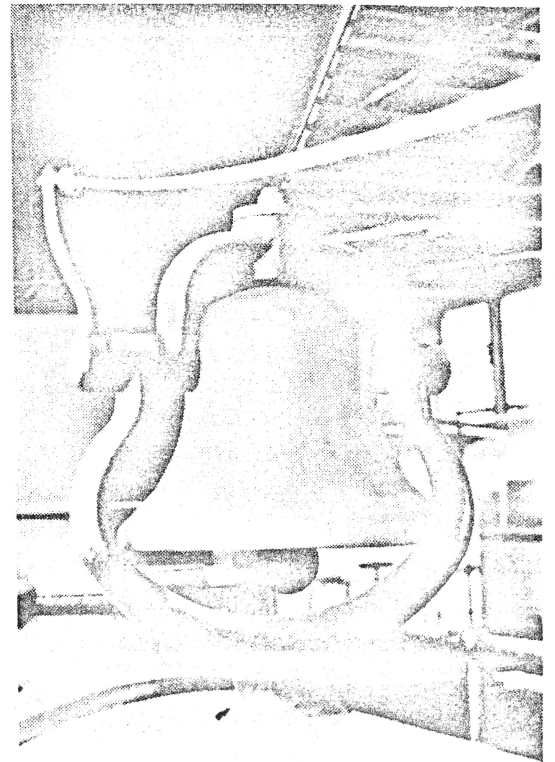
Polished brass bands and fittings.



Key System Railway, Inspection Barn, Oakland, California, February 1976



Ornate Tender Foot Plate



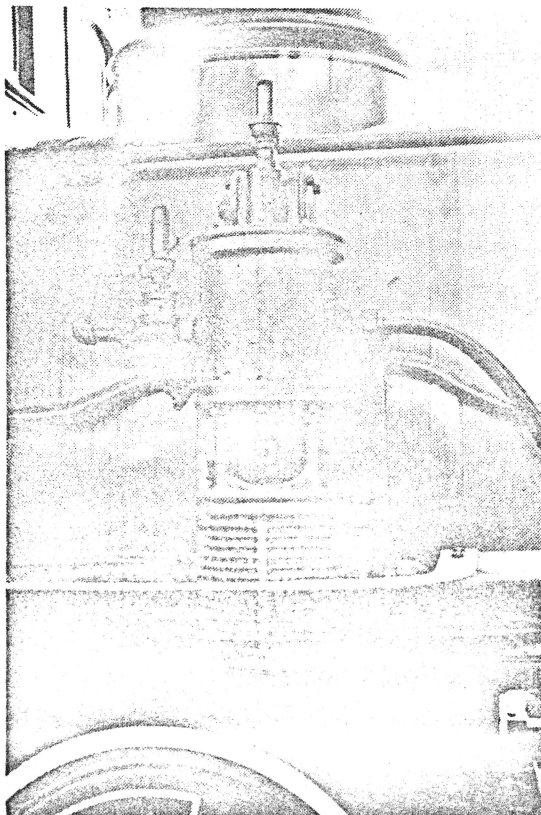
Bell, Stand and Yoke



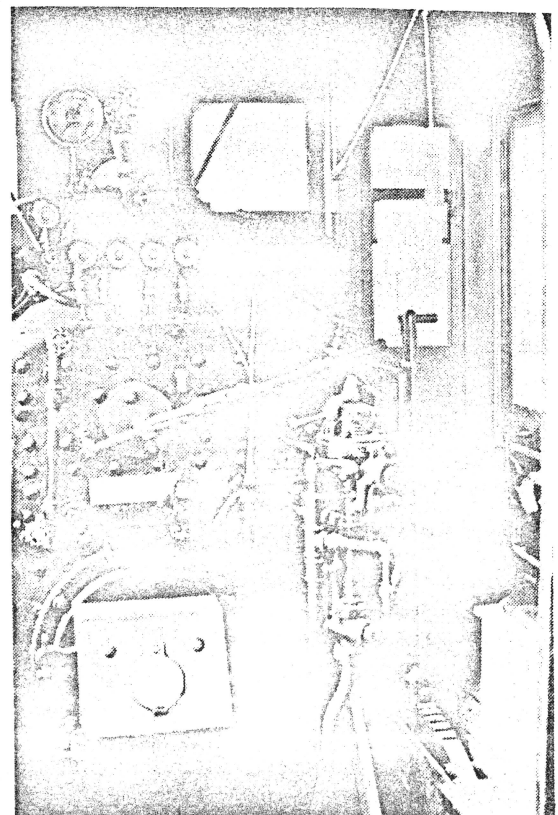
Oil Headlight and Balloon Stack



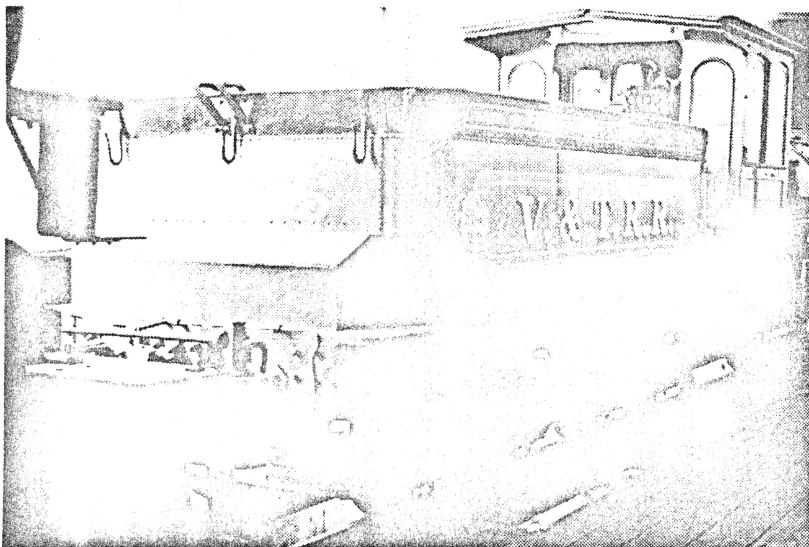
Cab, Fireman's Side



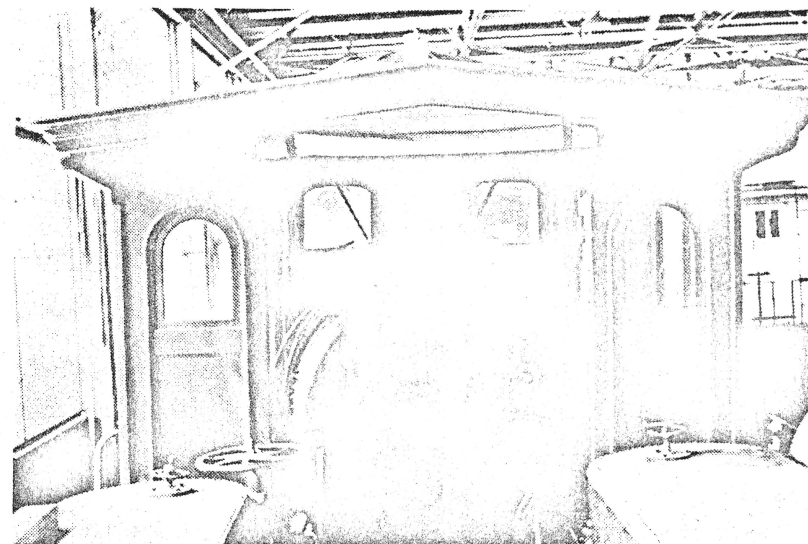
Air Brake Pump



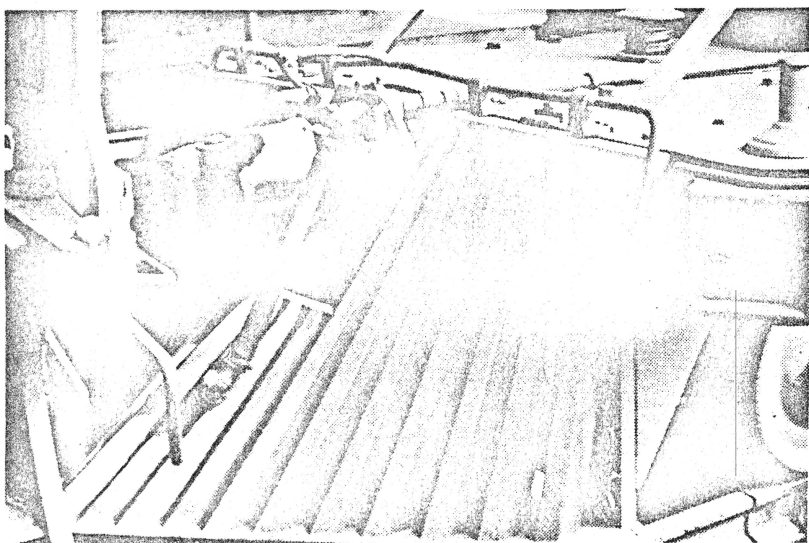
Boiler Backhead, Engineer's Side



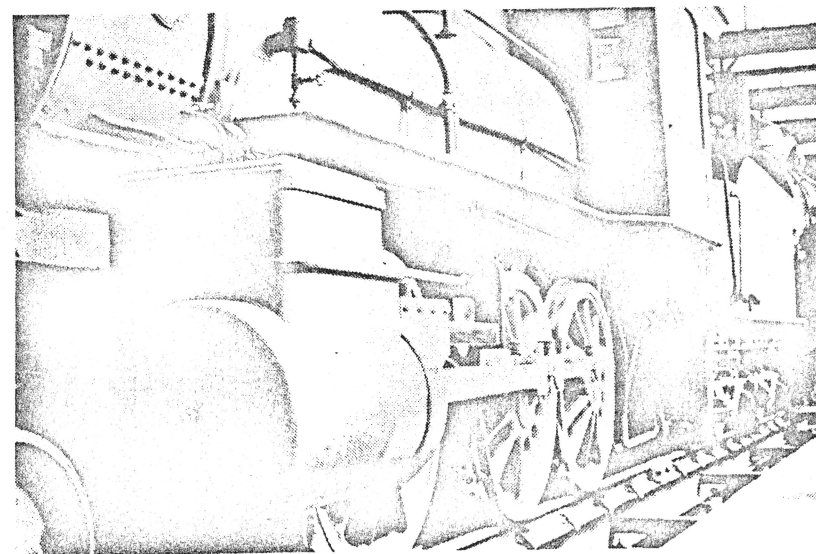
Rear Tender Hooks and Tool Box



Boiler Backhead and Rear of Cab



Wood Staved Pilot and Apron



Left Side Cylinder, Steam Chest and Running Gear

III. RESTORATION RECOMMENDATIONS

The recommendations set forth for V. & T. Locomotive No. 13 are for non-operational display based on immediate public display requirements and secondly, on long range restoration. The locomotive in its current physical condition, aside from general cleaning, paint touch-up and adjustment of the suspension system, is suitable for display. Full restoration to its 1873-1876 Baldwin Locomotive Works appearance should therefore be deferred as the long range plan for total restoration of the unit. Of the seven pieces under study in this report for inclusion in the Central Pacific Railroad Sacramento Passenger Depot, it is our opinion that the "Empire" ought to occupy first priority in the long range restoration plan.

While there are further cosmetic accessory alterations or improvements that could be performed for immediate public viewing--as in the case of an older style pilot--it is recommended in view of the locomotive's present displayable condition that the judicious expenditure of limited restoration funds would best be accomplished by only general cleaning and paint touch-up at this time. Further part and equipment modifications ought to be deferred until they can be included as part of a well-planned and documented long range total restoration of the locomotive. The engine has enjoyed a variety of interesting and unusual appearances in the course of its service on the Virginia & Truckee Railroad and regardless of which date in time is finally selected for the restored appearance, an existing reservoir of photographs and records will make possible a fully accurate restoration and a truly superb show piece.

Immediate Public Display

When moving the locomotive from Oakland to Sacramento, the presence of a knowledgeable steam locomotive craftsman will be essential for the proper adjusting of the presently sagging engine suspension system. The crane unloading of the locomotive at Sacramento may well be the last occasion the boiler and running gear are repositioned and this would be an opportune time to shortly remedy the present improper suspension alignment.

The fire box and boiler tubes have not yet been cleaned of all ashes and debris. Although there is no intention that the engine be operated, the fire box and tubes ought to be cleaned and properly stored to prevent further acid deterioration resulting from moisture in the ashes.

The use of plywood as a replacement material in restoration is, in most cases, a poor choice. It does not represent a finished surface in line with the state of the art and most likely will deteriorate rapidly even on static

display. The tender particularly has a plywood box built during 1966 in the wood storage area, apparently for use as a spacer. Presumably this was installed, in part, to create the appearance of a tender full of wood fuel without packing in a full three cords of wood. While this may be desirable for the display of the tender, it is incongruous when the locomotive is otherwise visibly set up to burn fuel oil. It is therefore recommended to resist the desire to stack wood in the tender as it will only add to a long list of improper representative conditions.

The historical interpretive display commentary would best be directed at this time towards the history of the locomotive, its builder, date of construction, successive owners served, type of use, etc. rather than giving the mistaken impression that "this is the way it looked".

The immediate public display preparation should be confined to thorough cleaning, tightening, more appropriate V. & T. painting and lettering which could be accomplished in three weeks for \$3,500.

Long Range Restoration

[Under preparation.]

[Artist Rendition of Virginia & Truckee Railroad

Locomotive No. 13 "Empire" as built in 1873

under preparation by Ronald G. Steiner.]

Report on Restoration Options
for the
Virginia & Truckee 2-6-0 Number 13,
the "Empire"

In May 1867 the Virginia and Truckee Railroad Company was incorporated by the financial interests of the Bank of California to build a railroad from Virginia City, Nevada to the Carson River and Carson City, Nevada. Construction was started in February 1869 and carried forward rapidly to completion in January 1870. Between 1871 and 1872 the line was extended to Reno, Nevada. The line continued in this form until 1905, when a branch was built from Carson City to Minden, Nevada. In 1938 the line from Virginia City to Carson City was abandoned, and in 1950 the remainder of the line ceased operation.

With the completion of the line to Reno in 1872 the Virginia and Truckee found its self short of locomotives to meet the increased traffic. A rush order was sent to the Baldwin Locomotive Works for two freight engines. These became the numbers 13 "Empire" and 14 "Esmerelda" and were delivered in early 1873, along with the previously ordered number 12 "Genoa". The locomotive was quickly put into service and worked through the boom period of the V&T. With decreased traffic in the late 1880's, the "Empire" was placed in storage in the Carson City enginehouse, where it remained until 1902. In that year it was given a complete overhaul and placed in service to meet traffic needs created by the Tonapah Boom. By 1918 traffic was again down and the "Empire" returned to storage at the Carson City shops. In 1924 the locomotive was sold to Pacific Portland Cement Company where it

worked until 1931, when it was retired with a badly burned crown sheet. In 1938 the "Empire" was donated to the Railway and Locomotive Historical Society, who gave it a cosmetic restoration in 1966 and presented it to the State of California in 1969.

In restoring the "Empire" there are four feasible options. The first is to restore it to its 1873 built appearance. Second and third are intermediate time periods: 1902-1910 and 1910-1918. The fourth option is to leave the locomotive basically the way it is. Attached is a chart comparing the four options and their effect on the major locomotive components.

Restoration to an 1873 as-built appearance would involve the most major, and most expensive, rebuild of the "Empire". We have no pictures of the locomotive in its original condition, and are not likely to find any. We do, however, have early pictures of sister engines that we can relate to our engine. We also have the builder's specification sheets for the "Empire", and have collected quite a bit of information on 1870's Baldwin practices that we can apply to the locomotive. Cost estimates for this period are \$50,500 - 53,500.

A 1902-1910 restoration would be quite a bit less expensive in time, effort, and money than an 1873 restoration. Most of the major components are already on the locomotive or are readily available. We have at least one photo of the "Empire" during this period, and can expect to find similar photos of its sisters. There are some question areas for this time period, but these can probably be resolved as we have settled similar problems in the past. Cost estimates for this period are \$26,000 - 31,000.

Restoring the "Empire" to its 1910-1918 appearance is the least expensive of the three accurate V&T restoration possibilities. This was basically the condition of the locomotive when it was given to the Railway & Locomotive Historical Society in 1938. A few changes, mostly cosmetic, were made in the 1966 rebuild of the engine by Bethlehem Shipyards, but these can be fairly easily reversed. Again most parts are available. Cost estimates for this period are similar to the 1902-1910 period are \$24,000 - 29,000.

Leaving the "Empire" more or less as it is has obvious economic, and probably political, advantages. The locomotive was rebuilt to serve as a sales tool for a museum. As such, it represents no particular time period on the V&T, although it is closest to the 1910-1918 period. Instead, it is a pleasant-looking locomotive that, to the general public, looks like it is from the 1870's and 1880's. As few people, aside from fans, are familiar with the changes that locomotives underwent over the years, this would not be objectionable to the majority of the visitors to the Museum. It is, however, contrary to some of the guiding principles that have been established for the Museum.

To summarize, there are three feasible historical options, in addition to leaving it as it is. These are first 1873, second 1902-1910, and third 1910-1918. The cost estimates range from \$24,000 to \$53,500. The major component changes are shown on the attached chart. Finally, a discussion of the different time periods and the advantages and disadvantages for the Museum is included in a separate report that also deals with the Virginia

and Truckee 4-4-0 #12, the "Genoa".

Kyle K. Wyatt

Historical Researcher

California State Railroad Museum

cc

Chronology of
Virginia & Truckee 2-6-0 #13 "Empire"
Baldwin Class 8-26D3, Construction No. 3091

October 8, 1872 - ordered from Baldwin
January 1873- completed by Baldwin
February 17, 1873 - arrived in Reno
February 20, 1873 - first run to Virginia City
February 26, 1873 - accepted from Baldwin messenger
July 1882 - overhauled at Carson City Shops
January - December 1888 - rented for several months to Southern Pacific RR.
1889-1902 - Seldom used
January-October 1902 - major rebuild and overhaul in Carson City Shops
January 31, 1910 number changed to 15
1910 - changed to oil fuel, new cab, other changes in several trips to
Carson City Shops
October 1913 - new firebox
July 1916 - broken driver - out of service 18 months
1917 - Pyle National electric headlight and generator added
May 3, 1918 - last steamed - retired, stored Carson City Shops
December 9, 1924 - sold to Pacific Portland Cement, #501- shipped by V.&T.
December 27, 1924 - left Carson City for Garlach, Nevada
1924-1931 - used in limited service as spare switch engine
1931 - retired with badly burned crown sheet
1938 - donated to Railway & Locomotive Historical Society
1938 - 1966 stored at Western Pacific Oakland Roundhouse (?)
June 21-November 25, 1966 cosmetic restoration at Bethlehem Ship Yard, S.F.
March 14, 1967 - moved from Bethlehem to former Key System Building
1967-1976 - stored at Key System Building
September 12-14, 1968 - displayed at dedication of the new Port of Oakland
August 10, 1969 - presented to State of California
1976 - moved into reconstructed Central Pacific Depot at Sacramento
1978 - moved to unit shop for restoration

Major projects needed for restoration options
of the Virginia and Truckee 2-6-0 #13

Item	1873	1902-1910	1910-1918
Cab	Replace	Rebuild	Reuse
Tender Frame	Replace	Reuse	Reuse
Smoke Stack	Replace or Rebuild	Replace	Rebuild
Pilot	Replace	Replace	Replace
Crosshead pumps and injectors	Replace injectors with crosshead pumps	Use injectors	Use injectors
Firebox Door	Replace	Replace	Reuse
Couplers	Replace	Reuse	Reuse
Headlight	Replace	Replace	Replace
Air Brakes	Remove	Repair and add 8" pump	Repair
Fuel Area	Remove coal slope sheet	use as is	Add oil tank
Boiler Jacketing	Replace	Replace	Replace
Smokebox Front	Reuse	Reuse	Reuse

2-6-0 V.&T. #13 (re#2nd 15)
"EMPIRE"

	1873	1902-1910	1910-1918	Present
Boiler	BLW	--	Stays drilled 1920's	Original w/dri stays
Boiler Lagging	Felt	Asbestos Magnesia	--	As 1902
Jacket	Russia Iron	Russia Iron Blued Sheet Iron?	Blued Sheet Iron	Galvanized - screwed
Jacket Bands	Four Formed Brass	Four Formed Brass	Four Formed Brass	3 replacements noseband origin
Safety Valves	1-BLW locking 1-Anderson	?	?	Post 1912 (proba more recent)
Whistle	BLW	BLW	BLW	1966 replacemen
Generator	none	--	1917 addition	Mount removed 1
Sanders	Straight pipe	--	Air sanders added date?	As 1910
Bell	BLW iron	-- iron?	-- iron?	1966 replacemen Brass diesel
Smokebox Front	BLW w/4 bolts	Original w/4 dogs added date?	--	As 1902
Stack	Yankee	Baldwin Sunflower	Straight (capped?)	Similar to Yanke 1966 replacement
Headlight	BLW Box	Acetylene	Pyle National Electric 1917	Small Box 1966 reproduction
Headlight Bracket	BLW	Replacement for Acetylene? --	--	As 1902 Original
Brass Flag Fixture	BLW	Removed 1902	--	none
Handrails	BLW Brass	--	--	Original
Running Boards	Wood w/brass nosing	Notched for Air pump	--	As in 1902
Lumber Plate	1 brass #13 BLW	--	January 31, 1910 Renumbered 2nd 15	Brass reproducti 1966
Builders Plate	2 brass	Date removed? Builders date removed	--	Brass Reproducti w/dates 1966
		7		

	1873	1902-1910	1910-1918	Present
Wild Plate	None	"Rebuilt 1903"	As 1902	Removed
Pilot Braces	BLW	--	--	original
Tag/Lamp Holders	None	--	Added after 1923	On smokebox
Cylinders	BLW	New headcastings 1902	--	As 1902
Truck	H.S. Taylor-26" wheels	Date? Griffin Tacoma 26" wheels	--	As 1902
Drivers	Tires tapered or coned 3/16" 2 1/2" thick tires	3 1/2" Midvale tires	Broken driver 1916- replaced	As 1918
Driver Fenders	BLW	--	Removed-post 1910?	None
Pilot Apron	Tool Box? Handrail w/turnings?	Tool Box?Handrail w/turnings?	--	No tool box handrail turning only
Pilot Beam	Wood poling pocket added?	Wood w/ poling pockets	--	Wood replaced 1966 As 1902
Pilot	Iron rod replaced w/footboards early	--	Woodstave 1912	Lightweight wood replacement 1966
Pilot Coupler	Unrecessed iron bar & rooster	Tower Coupler	New V.&T. casting 1910	As 1910
Cab	Ash w/name in brass	Number instead of name	Rebuilt ca.1910	1966 reproduction of ca.1910 cab
Cab Handrail	Small brass	--	1910-1912 safety design	As 1910-1912
Cab seats	BLW-style?	?	?	Rebuilt 1966
Firebox	BLW	--	Replaced Oct.1913	As 1913
Oilburning equipment	None	--	Added 1910	As 1910 except c tank removed 90% intact 1966
Stoves, Grates	BLW for wood	--	Removed 1910	As 1910
Firebox Door	BLW for wood	--	1910 oil	As 1910

	1873	1902-1910	1910-1918	Present
Steam Gauge	Post's	^{Crosby} Probably Ashcroft 1902	--	1966 replacement ex-ship gauge
Lubricator	Oilers in cab	Nathan 3 spot Hydrostatic	--	1966 replacement 4 spot Bullseye hydrostatic
Backhead fittings	BLW	?	?	20% missing, 40% inappropriate 1" plastic pipe
Crosshead Pumps/Injectors	Pumps-BLW replaced by injector	Changed to monitor #7 injector 1902	--	As 1902
Check valves	BLW	Replacements-date?	--	Probably as 1902
Tender brake	Tender brake only Double iron beam	Air 1902-wood tender brake beams	9 1/2" air pump	95% complete as 1910
Air Brake	Double iron beam no air	8" used air pump	9 1/2" air pump replacement	Woodbrake lever rt. rear driver
Tender Under Frame	BLW	?	?	1966 replacement
Light	None	--	Added 1912	Bracket still on engine
Rear Footboards & handrails	Probably none	probably footboards	Handrail probably added ca. 1910	Handrails & foot boards removed 19
Lagmounts	None	--	V.&T.-post 1912?	as post 1912
Footplates	BLW	--	--	3 original, 1 replacement
Rear Tender Hooks	Original?	Present	--	As 1902 (1873)?
Tender Tank handrails	BLW-small brass	--	4 iron rod 1910- 1912 safety	As 1910-1912
Tender Box Tool Boxes	BLW	--	--	Replacement?
Tender wheels & Trucks	BLW w/H.S. Taylor 26" wheels	--	Griffin Tacoma & Denver 33" wheels 1910 26"	Equalizer bars of Trucks modified? date? As 1910 replacement
Tender Tank	BLW	--	--	--
Tender Apron				

Parts not listed are assumed to be original at this time.

VIRGINIA AND TRUCKEE RAILROAD

LOCOMOTIVE NUMBER 13

"EMPIRE"

12/89

Research and Restoration Report

by

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CALIFORNIA STATE RAILROAD MUSEUM

Department of Parks and Recreation

January 1980

Preface

This report on the Virginia and Truckee locomotive "Empire", one of a continuing series of reports on the equipment being restored by the California State Railroad Museum, provides a brief history of the locomotive and a description of what has been involved in the restoration of it to its mid-1870s appearance. It includes a description of the results of research, a discussion of the restoration options available, and the reasons for the selection that was made.

The great quantity of research material (photographs, records, tracings, etc.) assembled in the course of this project are preserved in the archives of the California State Railroad Museum. Persons desiring elaboration on material in this report are referred to that source.

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VIRGINIA AND TRUCKEE

LOCOMOTIVE "EMPIRE"

Introduction

The California State Railroad Museum, a project of the California Department of Parks and Recreation, is being developed to interpret the important part that the railroads have played and are playing in the development and continued prosperity of California and the West. A major component of this project will be the Museum of Railroad History in Old Sacramento. This building will house a large collection of accurately restored 19th and 20th century railroad locomotives and cars, along with other interpretive displays, presenting the story of Western railroading.

One display will be an 1873 locomotive, built by the Baldwin Locomotive Works, and beautifully and painstakingly restored to its appearance when it first saw service on the Virginia and Truckee Railroad of Nevada. The locomotive will be placed in a separate display, surrounded by mirrors so that visitors may appreciate all aspects of this colorful and detailed example of 1870s construction practices.

The following report traces the history of this locomotive from its beginning in 1873 until the present. Included is a description of the restoration process and a discussion of the historical and archaeological research, and other factors, that led to its present appearance and condition.

History

In March 1868, the Virginia and Truckee Railroad Company was incorporated by the financial interests of the Bank of California to build a railroad in Nevada from Virginia City to the Carson River and Carson City, with a branch from Carson City to Reno. Construction was started in February 1869 and carried forward rapidly to completion in January 1870. Between 1871 and 1872, the line was extended to Reno, Nevada. The line continued in this form until 1905, when a branch was built from Carson City to Minden, Nevada. In 1938, the line from Virginia City to Carson City was abandoned, and in 1950 the remainder of the line ceased operation. For more detailed information on the Virginia and Truckee, the reader is referred to the fine works by Messrs. Beebe and Clegg, Kneiss, Myrick, et. al.

With the completion of the line to Reno in 1872, the Virginia and Truckee found itself short of locomotives to meet the increased traffic. A rush order was sent to the Baldwin Locomotive Works for two freight engines, delivered as Class 8/26 D 3 and 4, construction numbers 3091 and 3094. These became the numbers 13, "Empire", and 14, "Esmeralda", and were delivered in early 1873 along with the previously ordered number 12, "Genoa". The "Empire" was quickly put into service and worked through the boom period of the V&T. With decreased traffic in the late 1880s, it was placed in storage in the Carson City enginehouse, where it remained until 1902. In that year, the Number 13 was given a complete overhaul and placed in service to meet increased traffic needs created by the Tonopah Boom. In January 1910, the number was changed to 15, replacing an earlier locomotive that had been sold, and avoiding the unlucky number 13. By 1918, traffic was again down and the "Empire" returned to storage at the Carson City shops.

In 1924, the locomotive was sold to the Pacific Portland Cement Company in Gerlach, Nevada, where it worked as a reserve switcher until 1931, when it was retired with a badly burned crown sheet. The locomotive remained on the property until 1938 when members of the Railway and Locomotive Historical Society arranged for its donation to that history-minded organization.

The Pacific Coast Chapter of the Society moved the locomotive to a storage site in Oakland, California, and it remained in storage at several East Bay sites until 1966. Over the years, the engine had deteriorated greatly and, by 1966, it was obvious that if extensive work was not undertaken on it, the locomotive would have to be scrapped. At about this time, plans for a railroad museum in San Francisco using the Chapter's equipment, in planning for about 10 years, were proving unlikely to reach fruition, and the Chapter was looking into other possible options. The decision was made to give the "Empire" a cosmetic restoration at the Bethlehem Shipyard at San Francisco, after which it was used to help interest the State of California on the idea of a railroad museum in Sacramento. After the restoration, the "Empire" was returned to storage in Oakland, where it remained until 1976, when it was moved into the newly-reconstructed 1870s Central Pacific Railroad Passenger Station in Old Sacramento. It remained on display there until 1978, when it was taken to the Unit Shop restoration facility run by the California State Railroad Museum for a complete, historically accurate, restoration.

Research

Historical research on the Virginia and Truckee locomotive "Empire" had a head start before November of 1978, when it was trucked from the Central Pacific Station to the Unit Shop facility for the beginning of restoration work. First, the Unit Shop staff had previously restored the Virginia and Truckee combination car number 16, and a great deal of V&T information had been collected in that effort. A major contributor was Stephen E. Drew, whose personal collection of V&T records and photographs, and feasibility report on the car and locomotive were a continuing aid. Second, an 1876 Baldwin-built locomotive from the North Pacific Coast Railroad was undergoing restoration, and a great deal of information on Baldwin practices of the 1870s had been collected. Important collections of original Baldwin material, including books of construction specifications, paint, and detailing information, were located at the De Golyer Foundation in Texas and the Stanford University Special Collections in California. Copies of pertinent pages were acquired from these sources.

Upon arrival at the Unit Shop, preliminary research was begun to determine what time periods had adequate information available to support a historically accurate restoration. Paint samples were taken (see Appendix A for techniques) to determine how much original paint was still on the locomotive, and photographs and documents were surveyed to determine how much supporting information on paint and structure was available for different eras.

In December 1978, a report outlining the restoration options available was prepared and presented at a Museum curators' meeting. These options consisted

of an as-built to mid-1870s appearance, a 1902-1910 appearance, and a 1910-1918 appearance. Included with the report was a chronology of the history of the locomotive (Appendix B) and a component analysis of the locomotive for the three restoration periods listed above (Appendix C). Also included was the estimated cost of restoration for each of the periods.

The decision of the curators' meeting was to return the "Empire" to its appearance in the mid-1870s, representing a typical locomotive of that era. At the same time, a tentative decision was made to restore the "Empire's" sister engine, the Virginia and Truckee locomotive number 12, "Genoa", to its 1902 appearance, thus retaining that locomotive's existing operational capabilities. As the two locomotives were built at the same time for the same railroad, this would also show the changes that locomotives underwent during their years of service.

With the research need focused by this decision, specific research began on the "Empire" in earnest. Through further paint research, it was found that while many parts had been stripped or replaced during the life of the locomotive, a number of parts still had their original Baldwin paint. The original base color of the locomotive was "lake" or "wine", a deep maroon color. The cab side sheet had red and white striping. The sandbox cover had white and gold leaf striping, with green inside a diamond pattern formed by the gold. The drivers were painted red with white and gold leaf striping. The tender trucks were found to be from sister Virginia and Truckee locomotive number 4, the "Virginia", built by Baldwin in 1869. These had a base color of green, instead of lake, with black stripes. Two more green layers, one with

two layers of stripes and one with one layer, followed the first. On the fourth layer, the base color was lake with cream and white stripes. These parts were the only ones that had original Baldwin paint.

Where original samples were available, they were followed closely. In the case of the tender trucks, the lake layer was used with the striping slightly modified after study of photos and diagrams of locomotives contemporary to the "Empire". These same sources, including an 1875 builder's photo of Virginia and Truckee locomotive number 21, the "J. W. Bowker", were used in developing the paint schemes for parts of the locomotive on which no firm evidence could be found, such as the tender and the sandbox wrapper.

Photographs and builder's drawings were also of major importance in identifying and reproducing the parts, such as crosshead pumps, which had long since been removed from the locomotive and were unavailable. Locomotive maintenance records for the Virginia and Truckee and Baldwin specification sheets were also of major importance. Material gathered from studying the other two Virginia and Truckee locomotives in the Museum's collection, V&T locomotives held by the State of Nevada, and non-V&T locomotives held by the Museum, Nevada, and Warner Brothers was also used to supplement available information. On many original parts, the Baldwin Locomotive Works had stamped an identifying number, either the class number, 8/26 D 3, or the construction number, 3091. With this, the originality of such major components as the frame, boiler, and tender tank was established, while the tender trucks were traced to the "Virginia".

An example of the difficulties encountered in determining the appearance of 100 year old components was the problems encountered with the safety valves. The specification sheet listed one Baldwin balance type and one Anderson type. The Baldwin balance safety was easy to identify, as it was often used and showed in photos and contemporary mechanical drawings. Of the Anderson safety, on the other hand, there was no trace. Only the "Empire" and her sister, the "Esmeralda", of all the Virginia and Truckee locomotives, were ordered with this type of safety. A study of the dome top revealed holes for studs very similar to the contemporary, and common, Baldwin locking type safety. From this, it appears that the Anderson safety was similar to the Baldwin design. It was, therefore, decided to use the Baldwin locking type since we had a sample of this to copy. If, in the future, the Anderson type is identified, it can be substituted for the Baldwin locking safety valve.

Restoring the locomotive to its early Virginia and Truckee appearance, instead of its factory-new appearance, allowed the use of several modifications made on the V&T soon after the locomotive arrived. Among the changes are the addition of the characteristic poling pockets on the pilot beam, the wrecking cable hooks on the back of the tender, and the use of cylinder-located "tallow-pot" lubricators instead of the Baldwin-supplied cab-located lubricators. This will provide some contrast with the factory-new appearance of the North Pacific Coast Locomotive "Sonoma", built by Baldwin in 1876, and displayed in the Museum near the "Empire".

Restoration

While research was continuing on the "Empire", work got underway on the actual restoration. This work was divided into two parts, the locomotive and the tender, both progressing concurrently. The first step in working on the tender was to remove the tank from the frame so that the metal sheets could be repaired. Holes from appliances not to be used in the restoration were filled and ground smooth. Cancerous rust spots were removed and the resulting holes filled. The tank was then sandblasted, a new water tank cover attached, and a rust-preventative paint applied.

The trucks were the next to receive attention. With the tender frame on shop stools, the trucks were removed and sandblasted to clean them. The journals were cleaned and repacked, and the journal box lids put on. Several new lids were cast to replace missing and broken lids. New brake beams were made of oak, and the brake rigging was reinstalled. The trucks were then painted lake and striped in preparation for placing them under the rebuilt tender.

The tender frame required major attention. After removing the decking, major areas of dry rot were found. New beams were cut, replacing all but one end timber. The new frame was then assembled, the mortise and tendon joints going together like a giant Chinese puzzle. The sill tie rods were installed, two new ones having been fabricated to replace missing parts. Next, the hardware was reinstalled, including two replacement step castings and a new link-pin coupler pocket. The frame was primed and new decking applied.

With all components now ready, it was time to reassemble the tender. The tank was placed on the frame and fastened in place. A new rear tool box was built and installed. The brake gear for hand brakes (air brakes were not yet in use) was installed, including a newly-cast Baldwin style brake wheel. A metal anti-skid plate was placed on the front part of the deck, extending between the water wings of the tank for a short distance. The tank sides were filled with putty and sanded smooth to cover the pits that years of exposure had placed in the metal. The tank and frame were then painted lake and the trucks put in place.

Special note should be made of the striping and gold-leafing applied to the tender tank and later to the locomotive. Based on research and photographs, stencils for the intricate patterns were made by Ronald G. Steiner. Mr. Jim Ingram, a professional in the field, was contracted to do the striping and gold-leafing. The process of gold-leafing is an involved one, and the techniques are not known by many people. The results of an experienced hand, as exhibited on the tender and locomotive, are impressive and worth the effort involved.

Work on the locomotive was proceeding concurrently with the tender. First, the locomotive was stripped to its drivers, frame, and boiler. The parts removed included the jacket and lagging, cab, pilot, pilot deck, steam dome cover and sandbox, stack, brake gear, lead truck, side rods and main rods, cylinder wrappers and valve casings, bell bracket, etc. The locomotive was then sandblasted and a protective paint coat applied.

Next, the lead truck was cleaned and reinstalled and appropriate areas of the engine painted black. Clear pine lagging (insulation) was then applied to the boiler. Baldwin had delivered the locomotive in 1873 with felt lagging. When the Virginia and Truckee Railroad overhauled the engine in the mid to late 1870s, pine was used as it was less expensive and easier to obtain. For similar reasons, pine was chosen for use in the restoration. Modern usage has substituted asbestos magnesia for pine.

A new brass steam dome wrapper was fabricated, and the steam dome cover and sandbox were reassembled on the locomotive. The firebox area and the smokebox were painted black to simulate the gilsonite-base heat resistant paint used in the 1870s. New jacketing was fabricated, using galvanized sheet metal. The original jacketing was made of Russia iron, a corrosion-resistant metal with a characteristic color and mottled texture. Russia iron has not been available since the early 1920s, and the costs of reproducing it are prohibitive. The reader is referred to the report on the North Pacific Coast "Sonoma" for a further discussion of Russia iron¹. To simulate the metal, painted galvanized sheet metal was used, it being as close as anything currently available in appearance.

The next step was to fabricate a new Baldwin-style "Yankee" stack with screen cinder catcher. To limit costs, the inner baffles were not reproduced, since operation of the locomotive was not planned. This will not be visible in the display. A newly-cast base was attached to the stack and the whole assembly applied to the locomotive. New steel cylinder wrappers were cut and installed. Non-working copies of Baldwin-style check valves were assembled from castings and fabrications and installed.

Metalworker Chris de Witt completed several projects of special note. First was the complete fabrication of an iron rod pilot characteristic of the early Virginia and Truckee Baldwin-built locomotives. These pilots had long since been replaced, and drawings had to be made from old photographs. The second project involved the crosshead pumps. The original pump bodies, barrels, and top chambers were cast of brass with the surfaces finished smooth and polished, and reproductions were also cast. The bottom chambers were also originally cast of brass, but were painted rather than polished. These were fabricated in the metal shop and worked over to look like castings. A new ear was attached to each crosshead, replacing ears removed with the pumps, and piston rods were attached to these. The whole pump assembly was then installed. The third project involved fabricating a new eccentric strap to replace a missing casting. The finishing process in this was much like that on the lower pump chambers.

The wood shop, under Kip Leight, fabricated and assembled a completely new cab, using ash as detailed in the original Baldwin specifications. A tin roof was applied and the whole cab painted. New running boards and headlight platform with brass nosings were fabricated and installed.

Driver and lead truck fenders were fabricated, painted, and striped. A firebox ash pan was also fabricated and installed, and a new firebox door was cast. Cab fittings such as drip cocks, water glass, and oil tray were fabricated, while the throttle and reverse lever and an old steam gauge were cleaned up. Baldwin had supplied cab-mounted cylinder lubricators, but these had soon been replaced by cylinder-mounted tallow pots. These were later replaced with

other designs. Drawings were again made from old photos, and the tallow pots were reproduced. The safety valves and the whistle were also fabricated.

Two reproduction builder's plates were cast in brass, using one of the original plates in a private collection as a master. The number plate is original, but the numbers had been ground off. Patterns were made, and new numbers cast and applied to the plate. All three were painted and the raised surfaces polished. The locomotive was painted, with striping and gold leaf added. Exposed metal surfaces were polished and coated with a hard wax to prevent oxidation. The addition of the original Baldwin-style bell and headlight completed the restoration.

Conclusion

During the course of the "Empire's" restoration much information was correlated, and new information was located, on the Virginia and Truckee Railroad and the Baldwin Locomotive Works. This body of knowledge will aid future restoration projects already planned, as well as improve the understanding of the history of the V&T and Baldwin.

Methodology used in research and restoration was also advanced by this project. Improved paint sampling and analyzing techniques were developed which resulted in more detailed information and less guesswork. The fabrication of simulated cast iron components resulted in significant savings of time and money. These and other advances should have effects well beyond the life of this project.

The total restoration cost for the locomotive was approximately \$80,000. The restored "Empire" will play a major part in interpreting the history of railroading in the West by prominently displaying the machinery and workmanship typical of the 1870s and 1880s, the most important era for rail expansion in the West. By comparing it with such engines as the V&T "Genoa" and the Southern Pacific Cab-ahead Number 4294, both to be displayed nearby, the visitor will be able to gain a better understanding of the changes that railroad equipment underwent during its life and the changes in technology exhibited in equipment built in later years. The "Empire" will also give the aura of the 1870s, with its simpler ways and colorful times.

APPENDIX A

Paint Research Techniques

Paint research is accomplished using modifications and refinements of the techniques described by M. W. Phillips and N. R. Weiss². The Phillips and Weiss technique consists of making a cut through all the paint layers with a sharp knife. This is then sanded smooth with 220 grit wet and dry sandpaper, lubricating periodically with oil, and finishing with 600 grit paper and oil. This leaves a dish-shaped crater. Using a 10x magnifying loop, the layers of paint can be counted and recorded.

The technique used on the "Empire" eliminates the use of the knife cut. Instead, 180 or 220 grit sandpaper and oil is used to take down several layers at a time, followed with 600 grit to polish. This makes it much easier to identify the various paint layers, and avoid missing any. It also allows any lettering to be exposed and traced before lower layers are investigated. Additionally, the surfaces of the different layers can be inspected for varnish and signs of sanding (which may indicate missing layers). While the process is a little slower than the original method, it is surer, and the results are believed to justify the additional time. The method has also been used, with 400 grit and 600 grit and oil, to reveal lettering and striping detail that was otherwise inaccessible.

In examining the revealed paint surface, a 10x magnifying loop is helpful. When a more detailed study of the surface is desired, a variable binocular

dissecting scope is used. This scope has a 0.7x to 3x variable element and either 10x or 20x eye pieces, depending on the magnification desired.

Lighting is very important when examining the surface of the sample area. During normal examination, a 150 watt floodlight is used. With increasing magnification or more critical examination, a photo flood or similar bright light source is used. Because of the heat produced by the bright light, its use is restricted, and the floodlight is used for preliminary examination and focusing.

In addition to identifying each layer of paint in relation to the others, each layer is color matched to a standardized system. The Pantone system is used for its ease and convenience, although supplementary systems are used when the color involved is beyond the capabilities of the Pantone system. More advanced systems are difficult to use in the shop setting. This information, along with tracings of lettering and striping, records and preserves information on paint appearance when the original paint is to be stripped off.

APPENDIX B

Chronology of

Virginia & Truckee 2-6-0 No. 13 "Empire"

Baldwin Class 8/26 D 3, Construction No. 3091

October 8, 1872	--	Order from V&T entered by Baldwin.
January 1873	--	Completed by Baldwin.
February 17, 1873	--	Arrived in Reno.
February 20, 1873	--	First run to Virginia City.
February 26, 1873	--	Accepted from Baldwin messenger.
July 1882	--	Overhauled at Carson City Shops.
1888	--	Rented for several months to Southern Pacific RR.
1889-1902	--	Seldom used. Stored Carson City Shops.
January-October 1902	--	Major rebuild and overhaul in Carson City Shops. Air brakes added.
1905	--	Air pump changed from 8" pump to 9-1/2" pump.
January 31, 1910	--	Number changed to 2nd 15.
1910	--	Changed to oil fuel, new cab, other changes in several trips through Carson City Shops.
October 1913	--	New firebox.
July 1916	--	Broken driver axle. Out of service 18 months.
December 1917	--	Pyle National electric headlight and generator added.
May 3, 1918	--	Last steamed on V&T. Retired, stored Carson City Shops.
December 6, 1924	--	Sold to Pacific Portland Cement of Gerlach, Nevada, as No. 501. Shopped by V&T.

December 27, 1924	--	Left Carson City for Gerlach, Nevada.
1924-1931	--	Used in limited service as spare switch engine.
1931	--	Retired with badly burned crown sheet.
1938	--	Donated to Railway & Locomotive Historical Society.
September 21, 1938	--	Shipped from Gerlach to Oakland, California, via Western Pacific Railroad.
1938-1966	--	Stored at Southern Pacific and Western Pacific Oakland Roundhouses and in Berkeley.
May 3, 1964	--	Ownership transferred to the Pacific Coast Chapter of the R&LHS from the national organization.
June 21-November 25, 1966	--	Cosmetic restoration at Bethlehem Shipyard, San Francisco.
March 14, 1967-June 2, 1976	--	Moved from Bethlehem to former Key System Building and stored.
September 12-14, 1968	--	Displayed at dedication of the new Port of Oakland.
August 10, 1969	--	Presented to State of California.
June 2, 1976	--	Moved to Southern Pacific Sacramento Shops.
1976	--	Moved into reconstructed Central Pacific Station at Old Sacramento.
November 16, 1978	--	Moved to Unit Shop for restoration.

APPENDIX C

Historical Component Analysis

2-6-0 V&T No. 13

"EMPIRE"

<u>Component</u>	<u>1873-1878</u>	<u>1902-1910</u>	<u>1910-1918</u>
Boiler	BLW	BLW	Stays drilled between 1911-1914
Boiler Lagging	Felt - replaced with wood	Asbestos Magnesia	Magnesia
Jacket	Russia Iron	Russia Iron	Blued Sheet Iron
Jacket Bands	Four Formed Brass	Four Formed Brass	Four Formed Brass
Safety Valves	1 - BLW balance 1 - Anderson	Replace 1 pop 1897-8	1 - 1897-8 1 - 1912
Whistle	BLW	BLW	BLW
Generator	None	None	1917 addition
Sanders	Straight pipe	Straight	Leach air sanders added ca. 1910
Bell	BLW	BLW	BLW
Smokebox Front	BLW w/3 bolts	BLW	BLW with 4 dogs added 1910
Stack	Yankee	Baldwin Sunflower	Straight
Headlight	BLW Box	Acetylene	Acetylene - Pyle National electric 1917
Headlight Platform	BLW	Replacement for Acetylene	As 1902
Brass Flag Fixture	BLW	Removed 1902	None
Handrails	BLW Brass	BLW	BLW

<u>Component</u>	<u>1873-1878</u>	<u>1902-1910</u>	<u>1910-1918</u>
Running Boards	Wood w/brass nosing	Notched for air pump	As 1902
Number Plate	1 brass No. 13 BLW	BLW	January 31, 1910 Renumbered 2nd 15
Builders Plate	2 brass	Removed - pre 1908	None
Rebuild Plate	None	"Rebuilt 1903"	As 1903
Pilot Braces	BLW	BLW	BLW
Flag/Lamp Holders	None	None	None - added after leaving Virginia and Truckee
Cylinders	BLW	New crossheads New headcastings 1902	As 1902
Pony Truck	H. S. Taylor - 26" wheels	Date? Griffin Tacoma 26" wheels	As before
Drivers	Tires tapered or coned 3/16" 2-1/2" thick tires	New 3-1/2" Midvale tires	Broken driver axle 1916 - replaced
Driver Fenders	BLW	BLW	Removed - post 1910?
Pilot Apron	Tool Box, Handrail	Tool Box, Handrail w/turnings?	Same as 1902
Pilot Beam	Wood-poling pockets added early?	Wood w/poling pockets	As 1902
Pilot	Iron rod replaced w/footboards	Wood stave 1902	New wood stave 1912
Pilot Coupler	Unrecessed iron bar rooster	Tower knuckle	New V&T pocket casting 1910
Cab	Ash w/name in brass letters	Number instead of name	Rebuilt ca. 1910
Cab Handrail	BLW small brass	BLW	1910-1912 safety design
Cab Seats	BLW - style?	BLW	Rebuilt 1910
Firebox	BLW	BLW	Replaced Oct. 1913

<u>Component</u>	<u>1873-1878</u>	<u>1902-1910</u>	<u>1910-1918</u>
Oilburning Equipment	None	None	Added 1910
Ash Pans, Grates	BLW for wood	For wood	Removed 1910
Firebox Door	BLW for wood	For wood	1910 oil
Steam Chest	BLW	1 replacement 1902	As 1902
Steam Gauge	Post's	Crosby - 1902	As 1902
Lubricator	Oilers in cab - replaced w/cylinder mounted tallow pots early	Nathan 3 spot hydrostatic	As 1902
Backhead Fittings	BLW	V&T modified	Further modified 1918
Crosshead Pumps/ Injectors	BLW pumps - replaced by injectors 1880s	Monitor #7 injectors 1902	As 1902
Check Valves	BLW	Replacements - date?	As 1902
Tender Brake	Tender brake only - Double iron beam - Wood beams added early	Air 1902 - wood tender brake beams	As 1902
Air Brake	No air	Am. Brake Co. system with used 8" air pump added 1902; 9-1/2" air pump added 1905	As 1905
Tender Under Frame	BLW Wood	Wood	Wood
Rear Light	None	None	Added ca. 1913
Rear Footboards & Handrails	Probably none	Probably footboards	Handrail probably added ca. 1910
Flagmounts	None	None	Ca. 1912-18 or later
Footplates	BLW	BLW	1 - replacement

<u>Component</u>	<u>1873-1878</u>	<u>1902-1910</u>	<u>1910-1918</u>
Rear Tender Hooks	Original?	Present	3 added - replacements?
Tender Tank Handrails	BLW - small brass	BLW	4 iron rod 1910-1912 safety
Tender Rear Tool Boxes	BLW 1 - rear	BLW	50' Fire Hose Reel
Tender Wheels & Trucks	BLW w/H. S. Taylor 26" wheels	26"	Griffin Tacoma & Denver 26" wheels 1910
Tender Tank	BLW	BLW	BLW - with water cooler
Tender Apron	BLW	BLW	BLW
Tender Coupler	2 slot BLW link-pin	Tower knuckle	New V&T pocket casting 1910

Parts not listed are presumed to be original at this time.

APPENDIX D

Paints Used in the Restoration of the "Empire"

Ditzler

DQE 5090 - Maroon

Lake on Locomotive

Dupont

Dulux Enamel - Custom Mix

Russia Iron on Jacket

Fuller-O'Brien

680-00 - Natural
220-23

Wood Filler on Cab
Wood Primer on Cab

Glidden

4551 - Black

Firebox and Smokebox

One-Shot

101-B - White
102-L - Fire Red
148-L - Dark Green

Striping
Drivers and Striping
Detail on Dome and Sandbox

Sherwin Williams

F65 G 41 - Forest Green

Cab Interior

California State Railroad Museum

STEAM LOCOMOTIVE SPECIFICATIONS: As Restored

Date: November 29, 1979

By: Kyle K. Wyatt

Locomotive: Virginia and Truckee locomotive no. 13

Builder: Baldwin Locomotive Works (M. Baird & Co.) Builder Number: 3091

Class: 8/26 D 3 Gauge: 4' 8-1/2" Wheel Arrangement: 2-6-0

Date Built: January 1873 Date Ordered: October 8, 1872

Driver Dia: 48" Type Bearings: Brass friction 6-1/2 x 8

Pilot Wheel Dia: 26 Type Bearings: Brass friction 4-1/2 x 7-1/2

Trailing Wheel Dia: --- Type Bearings: ---

Type Brakes, Engine: None

Driving Wheel Base: 9' 7" Maximum Overall Wheel Base: 40' 6"

Weight on Drivers: 61,000 lbs. Tractive Effort: 13,792 lbs.

Total Weight, Engine & Tender: 113,000 lbs. Cylinder Size: 16" x 24"

Type Valve Gear: Stephenson Type Valves: Slide

Main Crankpin Size: 4-3/8" & 4" Others: 2-1/2"

Main Rod Bearing Type: Brass friction Side Rod Bearing Type: Brass friction

Boiler Type: Steel wagon top Boiler Builder Date: 1872

Boiler Construction: Crown bar, lap seam Tube Mat'l: Iron, copper rings

Number of Tubes: 155 Dia: 2" Length: 10'

Firebox Length: 65-1/2" Height: 52-1/2" Width: 34-1/2"

Fuel: Wood Grate Area: 156"

Number of Safety Valves: 2 Type: 1 BLW Balance type, 1 Anderson

Pressure Settings: 130 lbs. - 132 lbs. Blowdown Valve Type: BLW

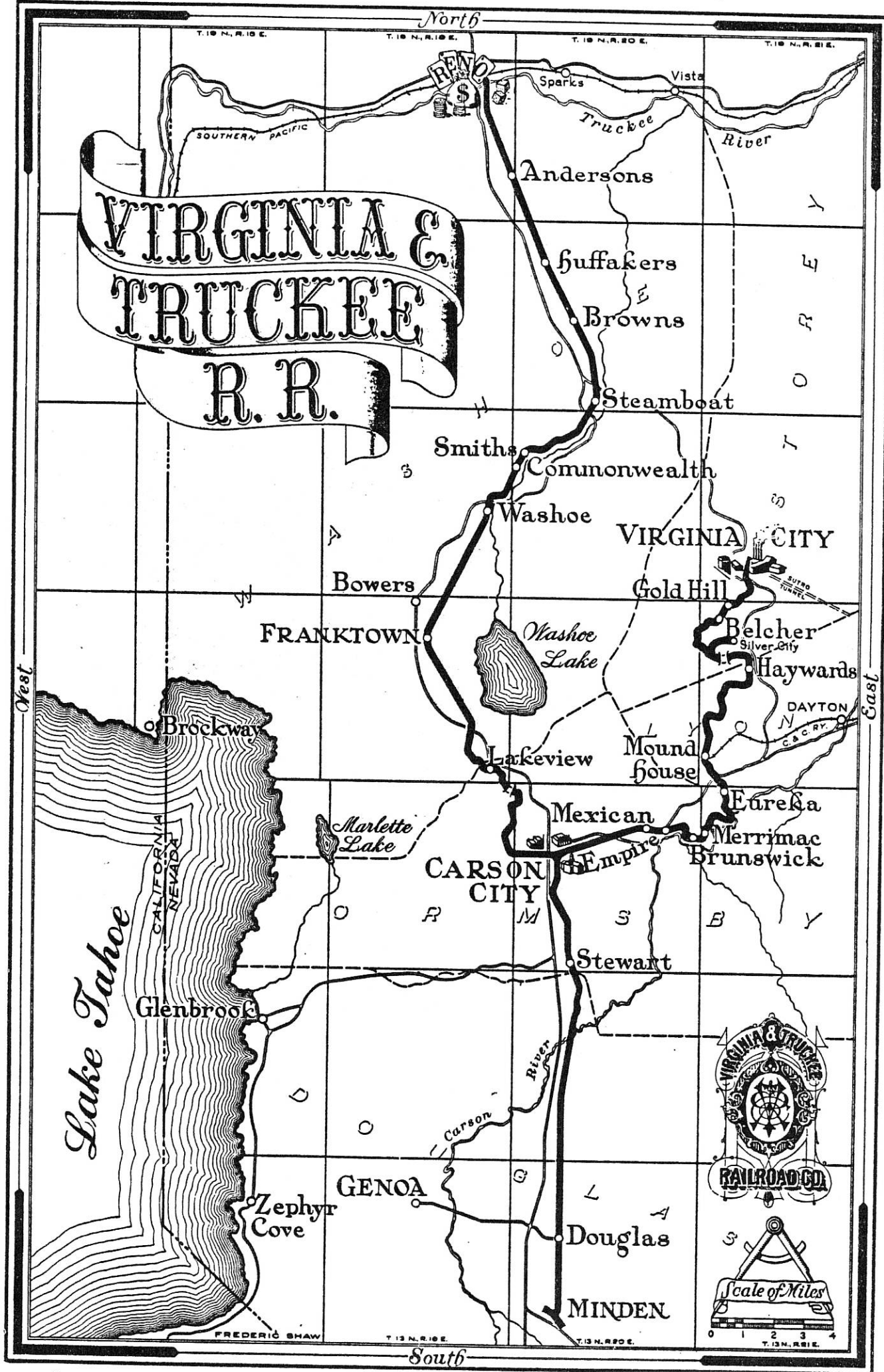
Number of Injectors: --- Type, Left: --- Right: ---

Number Check Valves: 2 Type, Left: BLW Right: BLW

Feedwater Pump: 2, crosshead Number of Water Sightglasses: 1

Type of Sightglasses: BLW Other Water Equipment: 4 drip cocks
Throttle Type: Balance Location: In dome
Number Lubricators: 2 Types: Tallow Pots
Lubricator Locations: Moved to cylinders by V&T
Number of Steam Gauges: 1 Type: Posts
Number of Air Gauges: --- Types: ---
Number of Cab Lights: 1 Type: Oil
Number Headlights: 1 Type of Light: BLW box, oil
Number Back-up Lights: --- Type of Lights: --- Location: ---
Whistle Type: BLW - single chime Location: Steam dome
Bell Type: BLW Bell Dia: 15" Location: Between domes
Communication/Signal Equipment: ---
Steam Heat Equipment Type: ---

Tender Type: Rectangular Tender Truck Type: BLW iron
Number of Wheels: 8 Dia. of Wheels: 26"
Type Bearings: Brass friction Journal Sizes: 3-1/2" x 6"
Water Cap'y: 2,200 gallons Fuel Cap'y: ?
Tender Weight Empty: ? Loaded: 43,000 lbs.
Tender Wheel Base: 13' 2" Frame Material: Wood



FOOTNOTES

¹Katz, Richard N., "The North Pacific Coast Railroad Locomotive #12 'Sonoma'". Unpublished report of the California State Railroad Museum detailing the restoration of the NPC "Sonoma".

²Phillips, M. W., and N. R. Weiss, "Some Notes on Paint Research and Reproduction". Apt. Vol. VII, No. 4 (1975).

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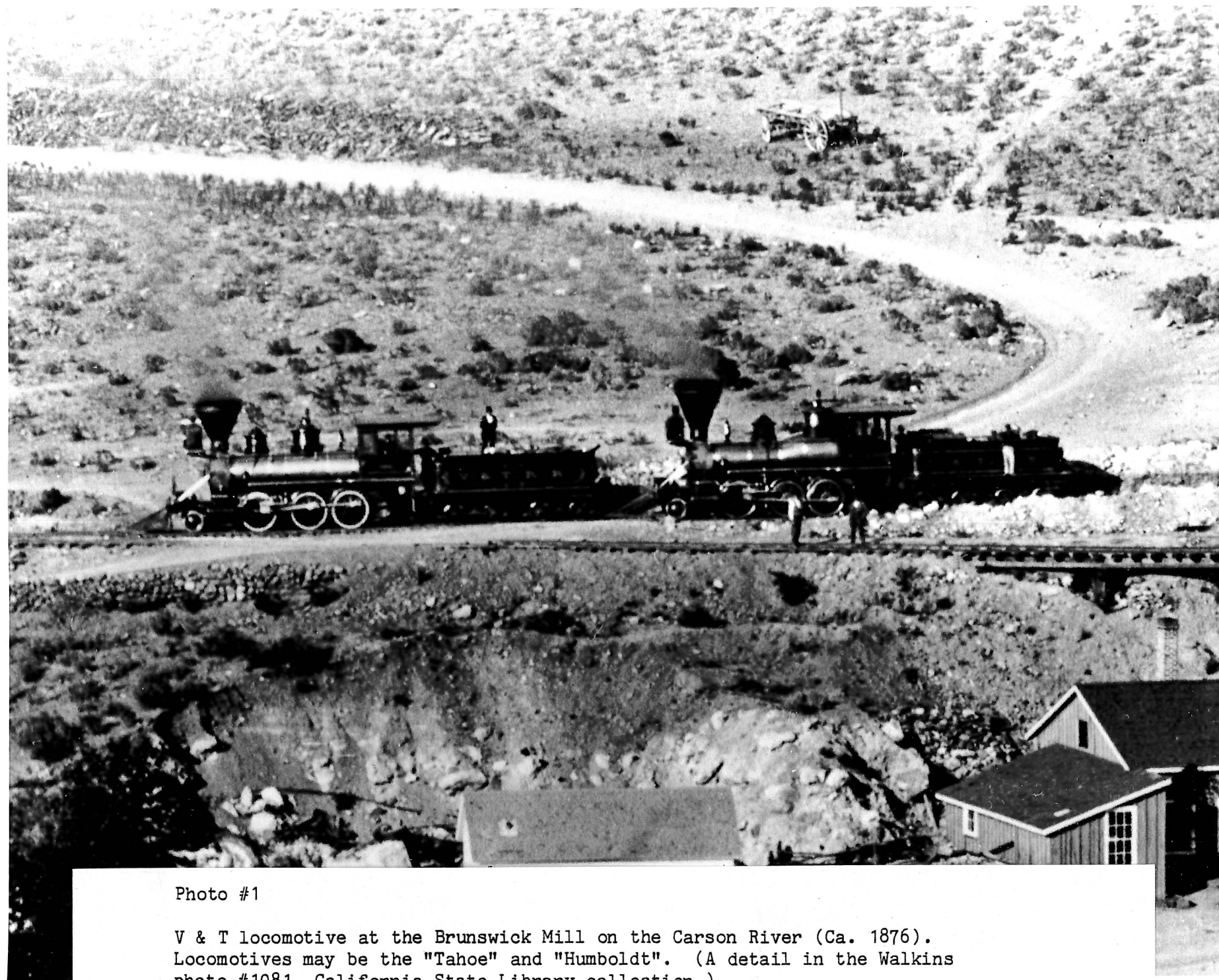


Photo #1

V & T locomotive at the Brunswick Mill on the Carson River (Ca. 1876).
Locomotives may be the "Tahoe" and "Humboldt". (A detail in the Walkins
photo #1081, California State Library collection.)

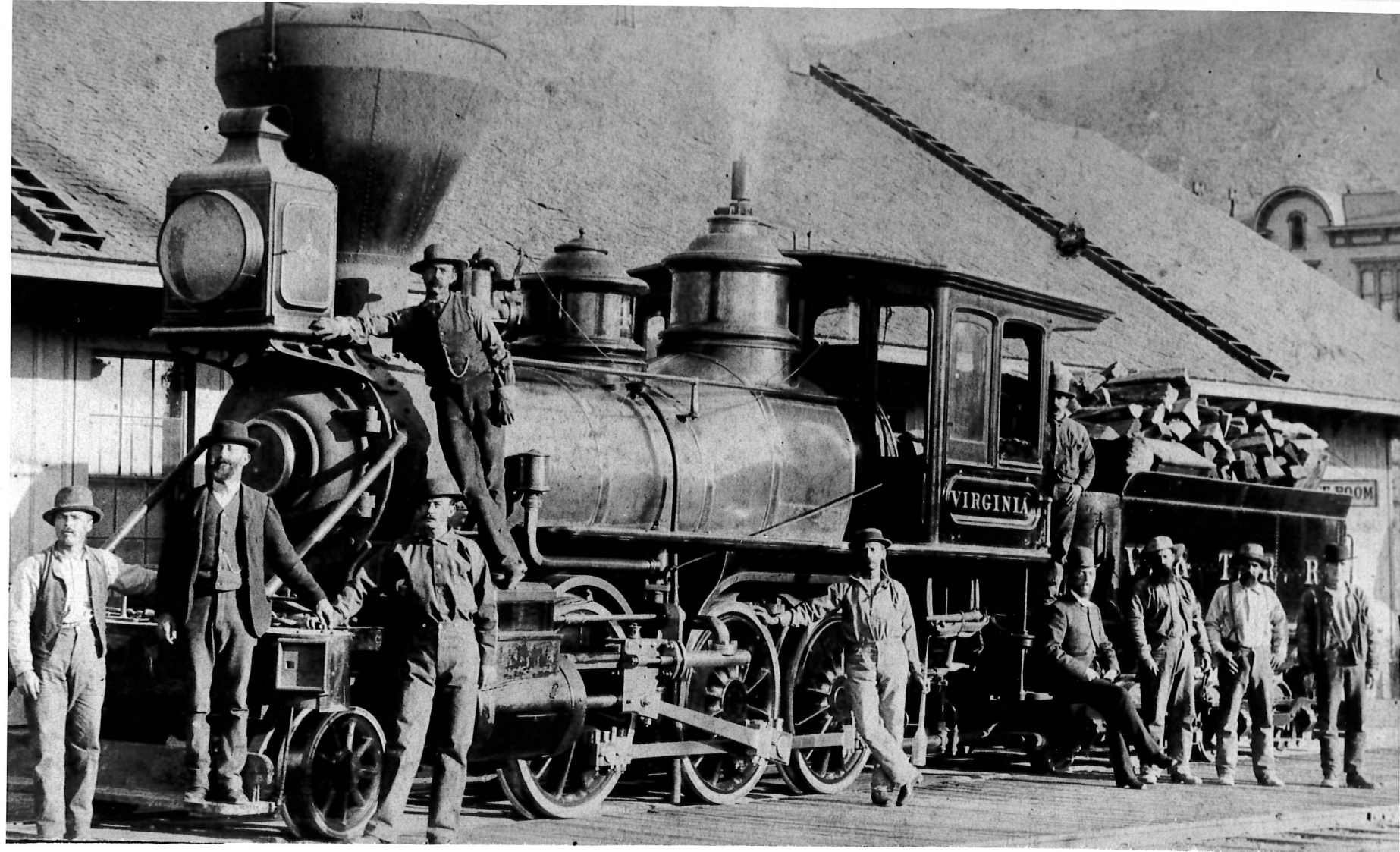


Photo #2

V & T locomotive #4 the "Virginia" at the E Street passenger station, Virginia City, Nevada (Ca. 1886-88). Research shows tender trucks from this locomotive are now on the #13, the "Empire". (Stephen E. Drew collection.)



Photo #3

The "Esmeralda", V & T locomotive #14, sister locomotive to the "Empire", the #13, as seen at Carson City in 1901. (Fred Jukes photo from Stephen E. Drew collection.)



Photo #4

The "Empire" "wooding up" at Carson City in 1906. (Stanley G. Palmer photo from the Gilbert Kneiss collection.)



Photo #5

The "Empire" in 1924 when sold to Pacific Portland Cement. Locomotive exhibits appearance it had when last run on the V & T in 1918. (Stephen E. Drew collection.)



Photo #6

The "Empire" in storage in Oakland before the renovation by Bethlehem Steel. Locomotive carries the #501 and PPC on the tender of Pacific Portland Cement. (Stephen E. Drew collection.)



Photo #7

The "Empire" before entering the CSRM Restoration Shop for restoration. Condition shows results of Bethlehem renovation. (CSRM photo 1979.)



Photo #8

Tear down of the "Empire" during restoration in the CSRM Restoration Shop.
(CSRM photo 1979.)

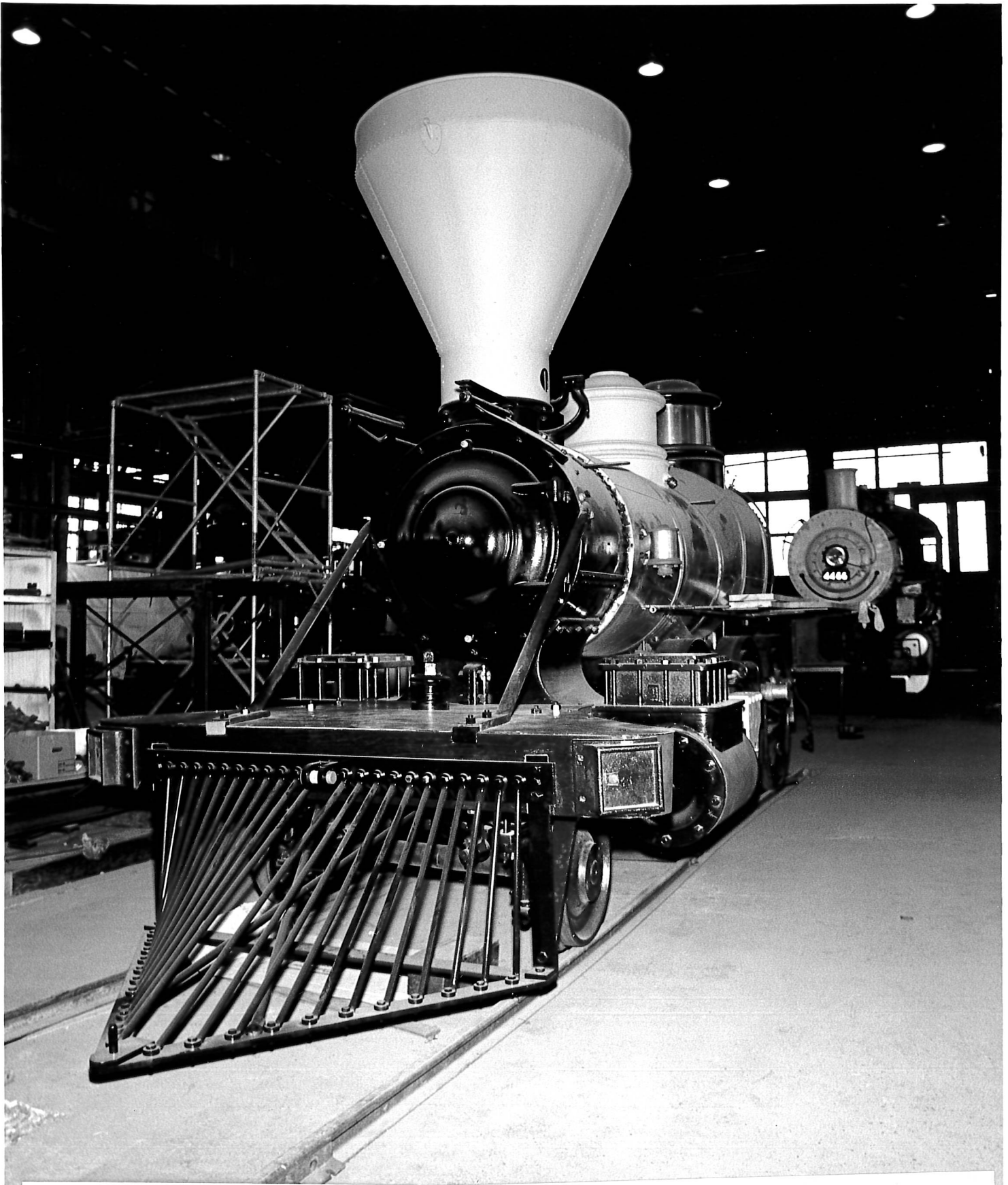


Photo #9

The newly constructed pilot and stack in place on the "Empire". (CSRM photo 1979.)



Photo #10

Fitting the new cab to the "Empire". (CSRM photo 1979.)

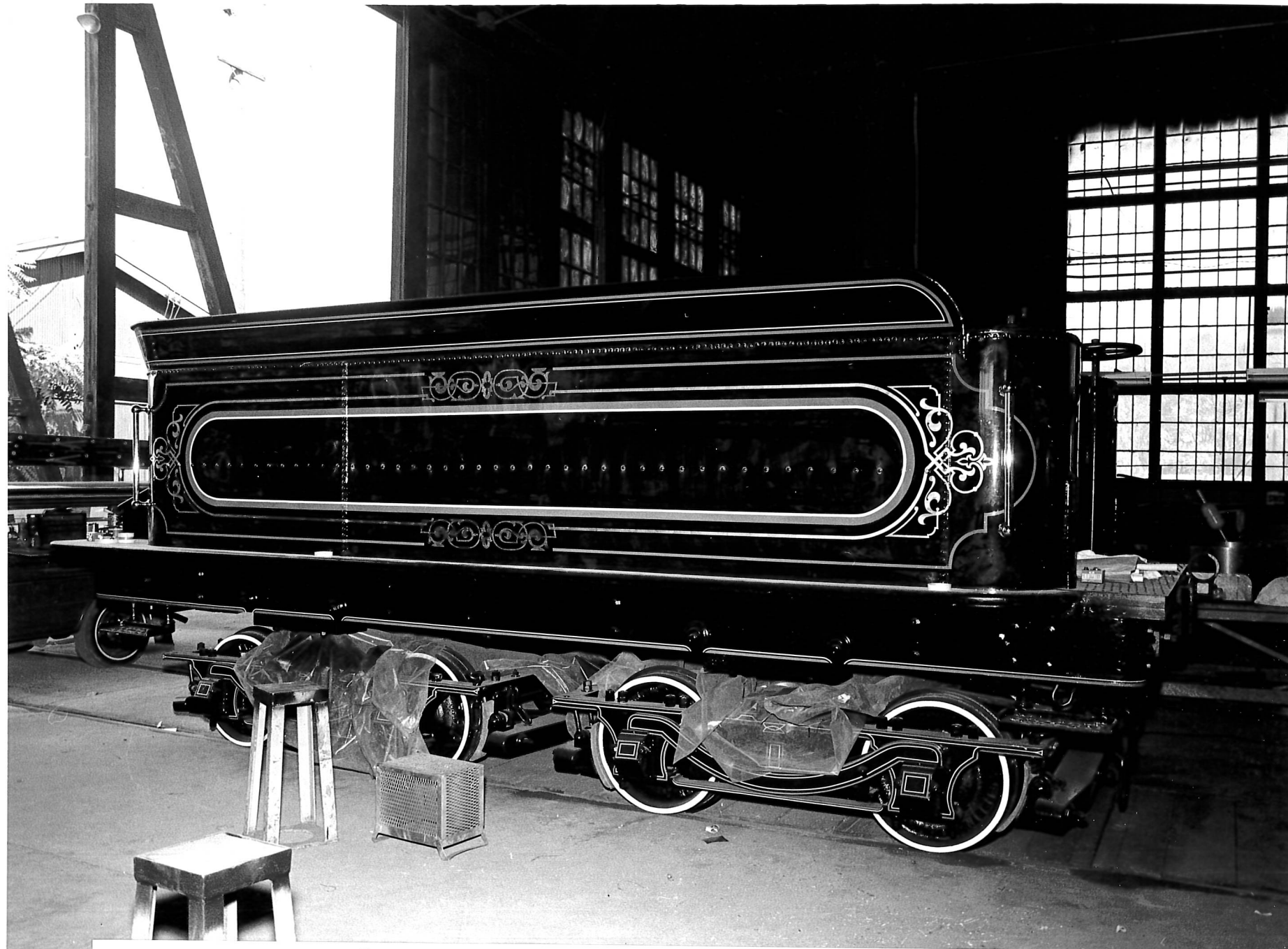


Photo #11

Tender of the "Empire" after restoration and striping but before being lettered. (CSRM Photo 1979)

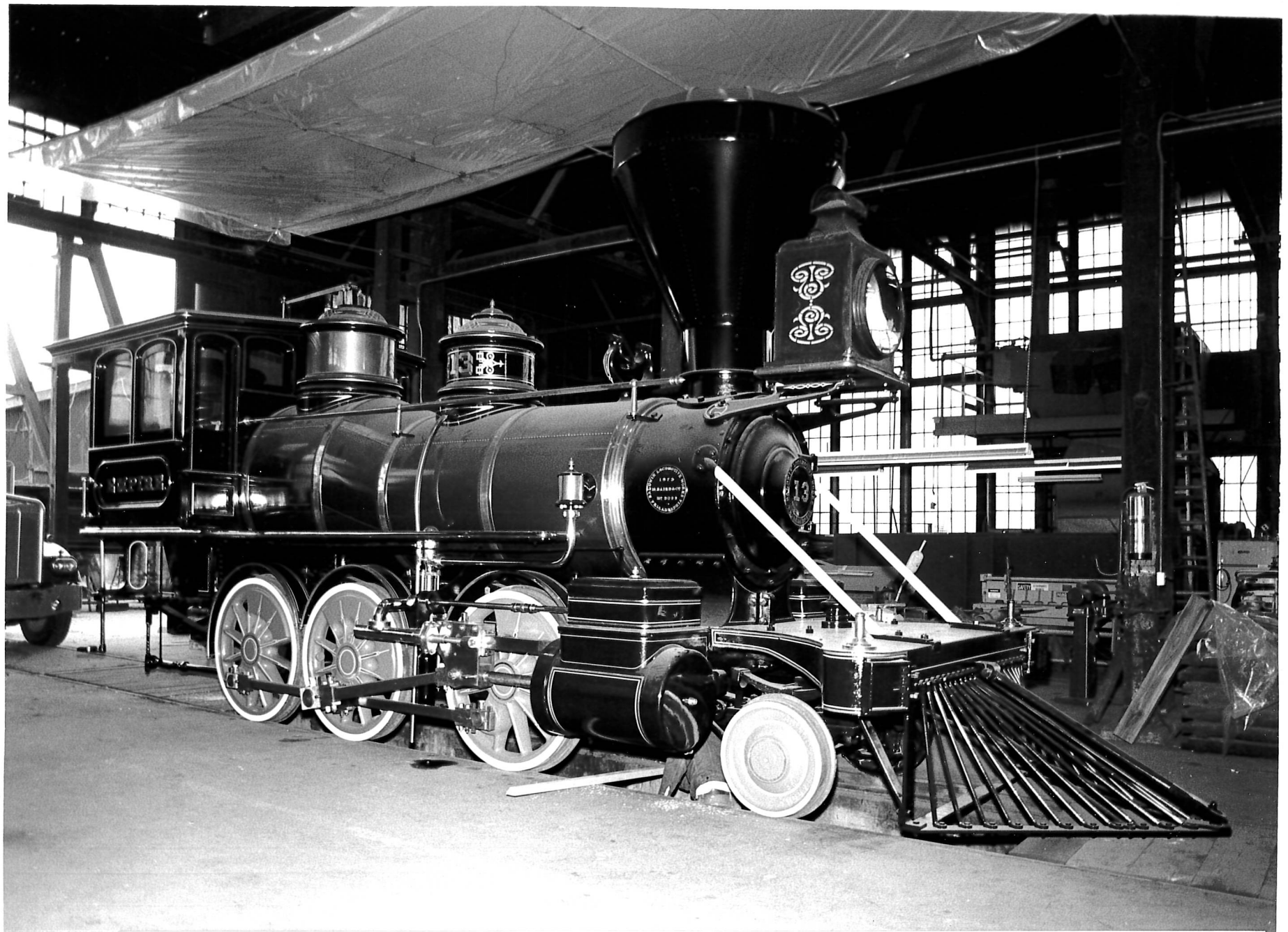


Photo #11A

The "Empire" in the CSRM Unit Shop near completion of the restoration process, 1979.
(CSRM photo 1979?)

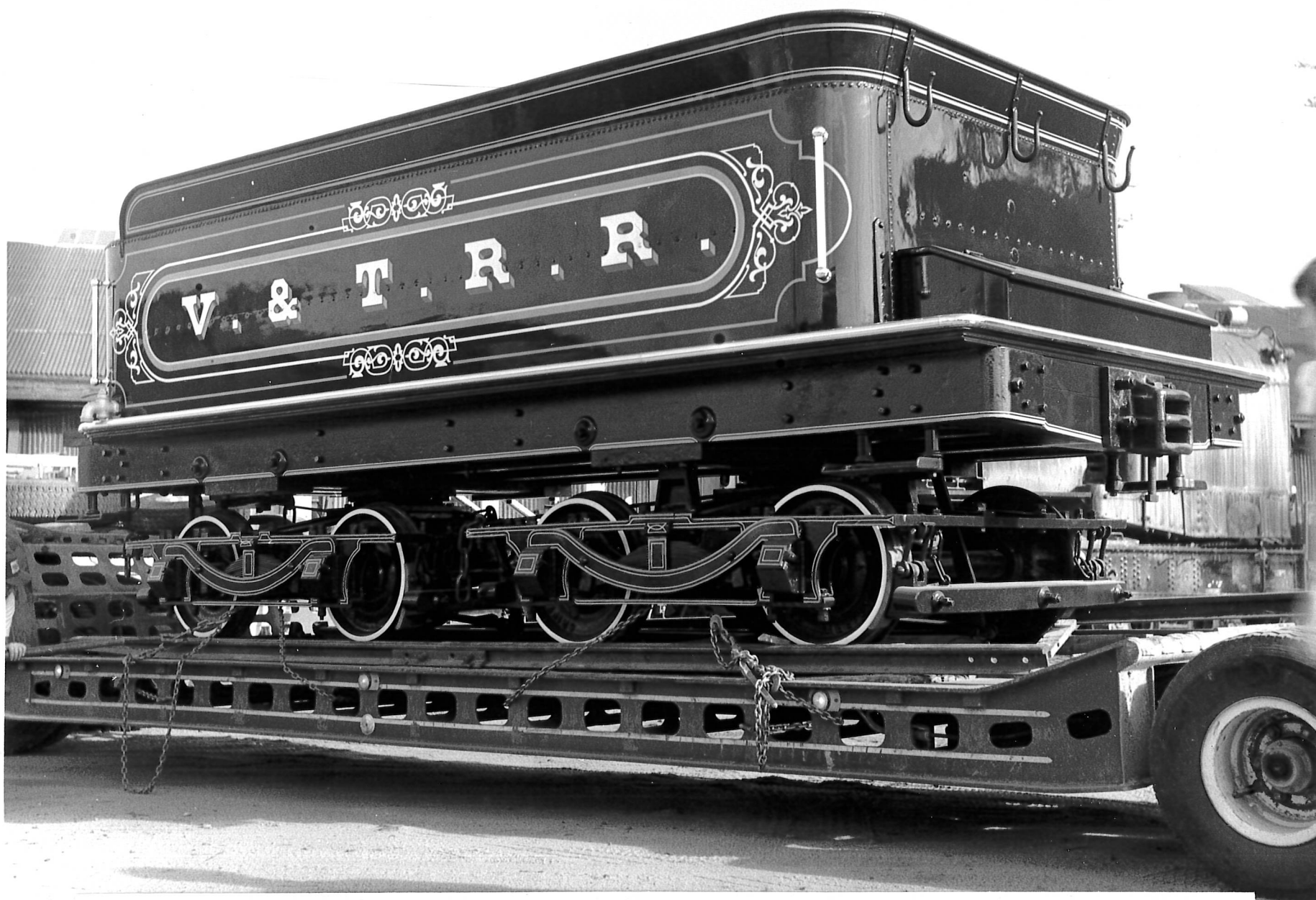


Photo #12

Tender of the "Empire" fully restored and ready to be stored pending opening of History Building. (CSRM photo 1980.)



Photo #13

The "Empire" fully restored. (CSRM photo 1980.)

Empire (U/T) Cab (right side?)
was partially rebuilt with OAE in
W.P. Oakland warehouse prior to
it being sent to Bethlehem Shipyards
for complete restoration. This
work was done by Jeff E Wetmore
(died 1999). RL & HS PCC was considering
scrapping locomotive and he was trying
to convince them to save it. I saw
the new site myself and know that
it was there. I was told that
this work was incorporated into
the new cab built for the locomotive
at the ship yards, but I never saw this.
The work done for by Jeff was
oak. I am told the work done
by the shipyard was in softwoods.
This work must have been done between
1963 and 1966.

David L Johnston
Bay Area Electric Railroad Assoc.
Rio Vista St

4-17-1990